

T H E S I S

THE EFFECT OF PROTAMONE FEEDING
ON THE
METABOLISM AND WOOL PRODUCTION OF SHEEP

Submitted by
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I HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER MY
SUPERVISION BY.....PEDRO A. LABARTHE.....
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INTRODUCTION

Statement of the Problem

The research presented in this thesis is concerned in general with the role of thyroid gland secretion in animal production. More specifically this investigation deals with the influence on the metabolism and wool production of sheep, of iodinated casein, a synthetic material showing physiological activity similar to that of the natural secretion of the thyroid gland.

Wool production is a major agricultural enterprise in Colorado as well as in the writer's native country, Peru. Although striking results have been reported on the effects of thyroid hormone and other substances of similar activity on growth, milk, egg, fat, and feather production, lack of information on wool production emphasized the importance of undertaking a study of this nature. Quite apart from obvious economic aspects, it was felt that the study might well yield information on the physiology of wool secretion.

Review of the Literature

Following the isolation of thyroxine by Kendall (24), and later its synthesis by Harrington and Barger (15), an accelerated research with different animal species firmly established the importance of the thyroid gland in the metabolic processes of animal life. Early interest in the fields of medicine and

agriculture led to activity resulting in the discovery of a number of substances, some of which initiated physiological response similar to the action of the thyroid hormone, while others reacted oppositely. While medical investigators were mainly concerned with therapeutic aspects of such research, workers in the field of animal production were interested in the application of findings to enhance secretory processes such as milk and egg production, and feathering on the one hand and deposition processes like growth and fattening on the other.

As early as 1913, experiments conducted by Gudernatsch (13) indicated that the feeding of thyroid gland substance initiated response similar to that elicited by intact thyroid gland secretion. In 1914, Morse (33) whose work was later confirmed by Rogoff and Marine (45) pointed out that iodized proteins produced physiological effects comparable to those of the natural thyroid hormone. Nagase (35) in Japan synthesized diiodotyrosine by the action of iodine on a mercury-tyrosine compound. Other iodine derivatives of tyrosine were prepared by Ludwig and von Mutzenbecher (29) from the acid hydrolysate of casein previously treated with sodium bicarbonate and iodine. Small amounts of thyroxine were obtained by the action of iodine on alkaline solutions of casein and other proteins by von Mutzenbecher (34), Ludwig and von Mutzenbecher (29), Harrington and Rivers (17), and Block (2). Lermen and Salter (28) relieved myxedema in human subjects with substances showing thyroxine-like activity prepared by iodination of proteins followed by hydrolysis and concentration.

More recently Turner (54) reported the synthesis of iodinated casein by treating milk with iodine followed by precipitation of the casein. This substance was first called thyrolactin but more recently has been named protamone.

Serious consideration of the importance of the thyroid hormone in animal production developed in 1917, when Welch (58) called attention to the condition of hairlessness of pigs, lambs, and foals in Montana, due to a deficiency of iodine in the diet of the dams. Later Hart and Steenbock (18) pointed out that dysfunction of the thyroid gland was responsible for the production of hairless pigs. In all cases the glands were hyperplastic and showed a reduced iodine content. Iodine feeding diminished the incidence of the disease.

Studies involving removal of the thyroid gland were reported by Simpson (49) who worked with lambs and kids. Thyroidectomy produced symptoms of cretinism and effected the cutaneous system in a striking manner. Horn growth was retarded, lighter weight fleeces were produced, and the animals tended to lose wool in patches. Thyroidectomized animals were much lighter in weight than were unoperated control animals at comparable ages. If however, thyroidectomy was delayed until three or four months of age, growth retardation was only slight. Chang (5) also reported a slowing of hair growth on thyroidectomized rats, which could be corrected by feeding suitable quantities of thyroid gland. Even when the animals were placed on a submaintenance ration, thyroid feeding maintained a normal hair growth in spite

of a declining body weight. Likewise thyroidectomy was shown to have an influence on feathering in birds by Emmens and Parkes (7). Working with different breeds these workers pointed out that feather color and structure modified by thyroid removal returned to normal upon thyroxine injection. In general thyroxine stimulated melanin formation, reduced fringing, and caused pointed feathers to become shorter and more rounded.

Brody (3) observed striking results following thyroidectomy of dairy calves. At approximately three years after operation, basal metabolic rate was about forty percent below normal. Body weight was much reduced, and horn growth was retarded. Other symptoms were paunchiness, a disk-faced appearance, no apparent heat periods, and rough hair which was not shed in the spring. A similar picture of stunted growth, paunchiness, and falling of hair was reported by Reineke and Turner (40) following thyroidectomy of young goats. The cretinism was arrested and growth was stimulated by feeding protamone. With beef steers Andrews and Bullard (1) observed more economical gains on a fattening ration following thyroidectomy at the time the animals were placed in the feedlot.

That thyroidectomy causes a decline in milk and fat secretion by dairy cattle was shown by Graham (11,12). Thyroid feeding or thyroxine injection brought about secretion approaching that of normal production. Milk and fat production was increased following thyroxine injection in normal, unoperated animals. Jack and Bechdel (22) also reported an increase in milk

production upon injection of thyroxine. Herman, Graham, and Turner (20), feeding dessicated thyroid at a level of two ounces daily for eight weeks to cows at peak production, were able to maintain a high production level of 52 to 55 pounds of milk. Production dropped to 42 pounds when thyroid feeding was discontinued. Four cows just past the peak of their lactation showed increases of 18 and 35 percent respectively in milk and fat production. Injection of 5 milligrams of thyroxine daily for three weeks increased milk flow 11 percent, and butterfat production 22 percent. Increases in milk and fat production of 13.6 and 22.5 percent were also reported by Ralston and co-workers (39) following subcutaneous injection of 15 milligrams of thyroxine daily for three successive days each month during a nine month period.

That iodinated casein showed physiological activity similar to that of dessicated thyroid or thyroxine was shown by Reineke and Turner (42). Fourteen dairy cows fed 50 to 100 grams of protamone daily for a three day period responded by producing 8.59 percent more milk and 28.7 percent more fat. Heart rate increased parallel to the rise in milk yield. These workers also stated that the feeding of 5 to 10 grams of protamone increased the milk production of goats 10.51 percent. Reineke (42) working with a herd of 27 cows including Jerseys, Guernseys, and Holsteins reported an average increase of 18.6 percent in milk production following the daily feeding of 1.5 to 2.5 grams of protamone per 100 pounds body weight for periods up to three months.

Winchester (61) pointed out that thyroxine injection tended to restore normal egg production in thyroidectomized hens in a manner analogous to its effect on milk production by cows. Increased egg production was also observed by Turner, Irwin, and Reineke (56) when White Leghorn hens were fed protamone. These workers (55) also produced superior feather growth by feeding protamone to Barred Rock cockerels. And increased growth rates and quicker feathering in young chicks receiving protamone were reported by Irwin, Reineke, and Turner (21).

EXPERIMENTAL

Experimental Subjects

Sixteen three year old Rambouillet ewes with lamb were selected for this study. The ewes were bred and raised in the San Luis Valley of Colorado and were selected on the basis of uniformity of body size and conformation (Figures I and II). The animals were divided into four lots of four ewes each according to size, weight, type, and condition. Each group was placed in separate experimental pens measuring twelve feet in length by ten feet in width.

Wool Measurements

The ewes were shorn on April 23, 1944 and April 18, 1945. Fleece weights of all animals were recorded when sheared. Moisture content of the fleeces was determined by drying to bone dry condition representative samples of the fleeces. Shrinkage determination was done according to the method outlined by Wilson (60). The fleeces were passed through a dusting machine twice to remove dirt and foreign materials. Four 200 gram samples were taken from the dusted fleece and scoured in mesh bags following the standard emulsion process used by the Wool Laboratory (Figures III, IV, V, and VI.).



Figure I. Ewes used in the experiment.

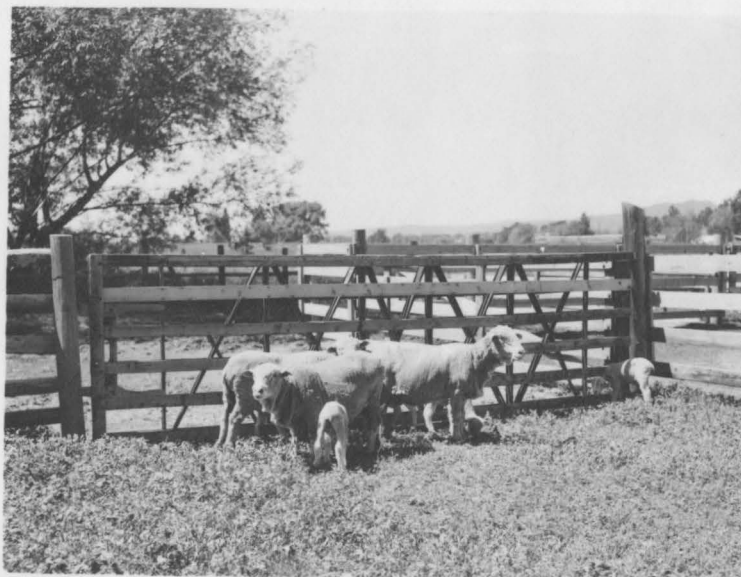


Figure II. Lot III at close of experiment.



Figure III. Weighing 200 gram sample for scouring.



Figure IV. Dusting the wool prior to scouring.



Figure V. Ringing the wool after scouring.



Figure VI. Drying the scoured wool.

Representative Area for Periodic Shaving: An area of the left shoulder was selected as the body location on which the wool characteristics were to be studied. Previous investigations have shown that wool produced on this area has yielded most representative results (38). An area two inches wide by five inches long was shaved from the shoulder area of each ewe. The selected area was demarcated by line tattooing to insure uniform sampling throughout the period of experimentation. Wool shaved from this area was dried to bone dry condition, weighed and analyzed for grease and suint content. This procedure was repeated every 28 days.

Diameter of Fiber: One hundred fibers chosen at random were measured with a micrometer caliper commonly used in technological wool studies (Figure VII). Each of the one hundred fibers was handled with a fine pointed forceps and placed between the jaws of the micrometer. Pressure was applied to the point where two ratchet clicks were audible. At this point the reading was taken to the nearest ten-thousandth of an inch. Each measurement was recorded and an average figure was computed for the one hundred measurements.

Length of Fiber: The same one hundred fibers used for the diameter determination were placed between glass slides and projected at a magnification of 10x. The projected images were traced in pencil on large sheets of paper. The tracings were then measured in millimeters, the values of which when divided by ten gave the actual length of fiber. (Figures VIII and IX).



Figure VII. Wool diameter measurement with micrometer caliper.



Figure VIII. Projecting fiber images for length measurements.



Figure IX. Tracing projected fiber images for length measurement.

Grease and Suint Extraction

Grease content of the shaven wool was obtained by chloroform extraction for six hours in a Soxhlet extraction apparatus. Following extraction, chloroform was distilled slowly from the extract and the recovered grease was weighed every four hours after drying in an oven at 106 degrees centigrade until constant weight was reached.

Suint content was determined by continuous extraction for six hours with distilled water in the Soxhlet extraction apparatus using the same samples from which grease had been extracted. The extract was dried slowly at 106 degrees centigrade and weighed every four hours to constant weight.

Digestion Balance Stalls

Ten digestion balance stalls devised to permit the separation and collection of excreta, were placed in a well ventilated and lighted building (Figure X). The floor of each stall was made of a strong iron grid through which the excreta passed. The feces were separated by a sloping, paraffin-coated screen, through which the urine passed onto a sloping paraffin-surfaced trough over which it flowed into a collecting bottle. Each stall was equipped with a permanently fixed feed box. Watering was accomplished by the use of small pails, which were removed immediately after the animals had finished drinking.

Digestion Balance Trials

Each digestion balance trial covered a period of twenty days, during which time two animals from each of the four lots



Figure X. Photograph showing construction of metabolism stalls used in the experiment.

were kept in the metabolism stalls. At the end of the first ten days of the trials the animals were removed from the stalls for a three day exercise period. Accurate weights of hay, grain, and water offered and refused were obtained and recorded daily. Urine and feces weights were also recorded daily. A representative aliquot of urine equal to five percent of the total produced by each animal was placed daily in a stoppered glass bottle to which toluene had been added as a preservative. Similarly a portion equal to ten percent of the well mixed feces of each ewe was also placed each day in a tightly covered galvanized can to which a little chloroform was added occasionally.

Other Metabolic Data

Body temperature, heart rate, and respiratory rate were recorded monthly for all of the animals on the experiment.

Body Temperature: Body temperature was measured by the use of a rectal thermometer.

Respiratory Rate: The respiratory rate was measured by applying the fingers loosely to the animals' nostrils and counting the respirations per minute. To eliminate errors due to excitement, countings were made until the figure remained constant.

Heart Rate: Heart rate was determined by counting systolic contractions by means of a stethoscope in successive half minute intervals until a constant figure was obtained.

Ration

The ration was calculated to meet the Morrison Feeding Standards. However, protein was increased in order to supply a

greater nitrogen demand resulting from protamone stimulation. The daily ration for each individual animal consisted of:

Alfalfa Hay.....2.20 lbs.

Ground Oats.....1.15 lbs.

Cottonseed Meal (41%).....0.35 lbs.

The ground oats and cottonseed meal were mixed in batches, each calculated to supply the feed for one month requirement for all animals. From this mixture a quantity sufficient for one week's supply for each lot was carefully mixed with protamone at the levels recommended by the producer. The quantities of protamone fed in these experiments are shown in Table 1.

Table 1. Quantity of Protamone Mixed with Grain

Lot No.	Calculated Increase in Metabolic Rate %	<u>Quantity of Protamone</u>	
		Per animal per day gms.	Per lot per week gms.
I	5	0.5	14
II	10	1.0	28
III	15	1.5	42
IV	None (control)	No Protamone	No Protamone

Grain mixture was fed in the morning and hay was given in the evening each day. The animals were watered twice daily before feeding at approximately 8:00 a.m. and 4:00 p.m.

Chemical Analyses

At the close of each balance trial composite samples of grain, hay, refuse, feces and urine were analyzed according to standard methods in the Animal Nutrition Laboratory. Analyses included determinations of moisture, dry matter, nitrogen, ash, calcium, and phosphorous.

OBSERVATIONS AND DISCUSSION OF THE RESULTS

Metabolic Data

Respiratory and Cardiac Activity: Respiration and heart rates were increased by the stimulation of protamone. Increases in both cases appeared to be related exponentially with the level of protamone fed, percentage increments becoming smaller with increasing amounts of protamone.

Dry Matter and Nitrogen Metabolism: Protamone feeding induced a small increase in dry matter consumption. All lots were fed substantially more dry matter than commonly recommended in order to supply an expected increase in metabolic demand due to protamone. Consequently, the control lot was probably over-fed, and the percentage increase in dry matter consumption shown by the protamone fed lots would accordingly be small. Within each lot there was a decline in dry matter consumption from the first balance trial to the last. An explanation for the decline in dry matter consumption may be found in the fact that the animals had received a maintenance ration prior to the beginning of the experiment and hence would show greatest dry matter intake during the first balance trial. A poorer quality of grain and hay fed during the last trial must be accepted as a possible factor in the observed drop in dry matter consumption (see table of composition in appendix).

Data shown in table 2 indicates that nitrogen retention was depressed by protamone feeding. All of the protamone fed lots showed negative nitrogen balances in all three trials. The degree of retention was related inversely with the level of protamone fed. The nitrogen retention for the control lot was positive in the first two balance trials, but became negative in the last. Digestibility of nitrogen which during the first trial was of the order of 75 percent dropped in the last trial to 45 percent. It is believed that the poor quality ration fed in the last trial was responsible for the reduction in nitrogen retention. Because the animals were well advanced in gestation at the time the last balance trial was run, it would be logical to assume that pregnancy would enhance rather than reduce nitrogen storage.

Water Consumption: Average water consumption for all three trials also indicated an increased metabolism due to protamone stimulation. Percentage increments for water consumption increased from 3.27 percent for lot I to 34.54 percent for lot III.

Calcium and Phosphorous Retention: In spite of adequate dietary calcium the animals in all lots showed an average negative balance for this element. Although it was negative, the calcium retention in each of the protamone fed lots was greater than in the control lot. Phosphorous retention, on the other hand, was positive in all lots, being slightly greater in the protamone fed lots than in the control lot. When each balance trial was considered separately, it was found that the control lot was the only one to show continued negative calcium balance during the third trial.

Table 2. Metabolic Data - Composite Table

Lot Number	I		II		III		IV
Calculated Metabolic Increase	5%		10%		15%		None (control)
	a	b	a	b	a	b	a
Respiratory Rate (per min.)	30.3	29.1	35.2	49.9	36.5	55.5	23.5
Heart Rate (per min.)	74.7	16.2	93.3	45.1	94.3	46.5	64.3
Dry Matter Consumption. gms./24 hrs.	974.6	6.0	953.9	3.8	972.5	5.8	919.4
Water Consumption. gms./24 hrs.	3091	3.3	3400	13.6	4027	34.5	2993
Nitrogen Retention. gms./24 hrs.	-4.794	-137.2	-2.074	-116.1	-11.678	-190.6	12.889
Calcium Retention. gms./24 hrs.	-2.906	55.1	-2.822	56.4	-3.744	42.2	-6.474
Phosphorus Retention. gms./24 hrs.	4.647	19.3	4.833	24.1	4.727	21.4	3.894

a - Absolute values. Average for three trials.

b - Percentage increase or decrease from values of control lot No. IV.

The reason for the negative calcium balances in the face of adequate calcium in the diet is not clear. The animals were shifted from a maintenance hay ration having a calcium-phosphorous ratio of 7:1 to a ration having a ratio of 1.3:1 when they were placed on experiment. It is quite possible that the relative increase in phosphorous intake would lead to calcium depletion. However, it does not seem that such a factor would be operative after so long a period on the experimental ration. Furthermore, one would assume that the advanced stage of gestation would tend to increase calcium retention.

Wool Production

Length and Diameter Measurements: Charts III and IV indicate a decided seasonal influence on the diameter of wool fiber, showing a maximum in December and declining in the summer months. That a possible correlation exists between this seasonal variation in diameter and the activity of the thyroid gland, which has been reported to be greatest during winter, is borne out by the fact that the lots receiving protamone showed greater increase during the cold months and less tendency to decline in the warm months. Fiber length, however, (Chart IV) did not appear to be effected by seasonal change, but increased constantly throughout the year from one shearing period to the next. Length increase appeared to change in a reciprocal manner with diameter change. During periods when diameter increased most, the increase in fiber length was depressed. Likewise at those periods when minimum values for diameter were observed increase in length was greatest.

CHART I
PERIODIC VARIATION
IN
GREASE CONTENT
PERCENT CHANGE FROM INITIAL MAY
VALUES AS BASE

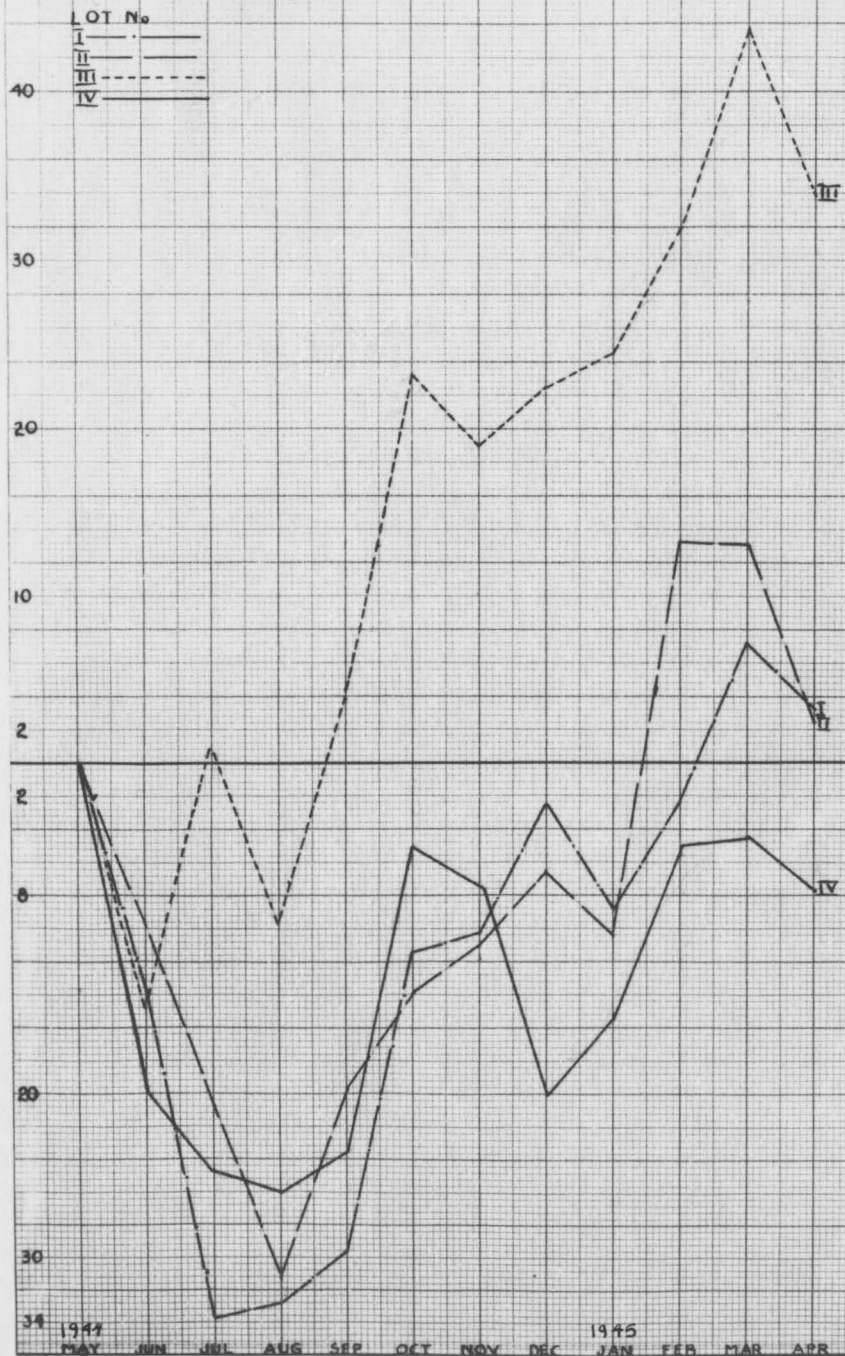
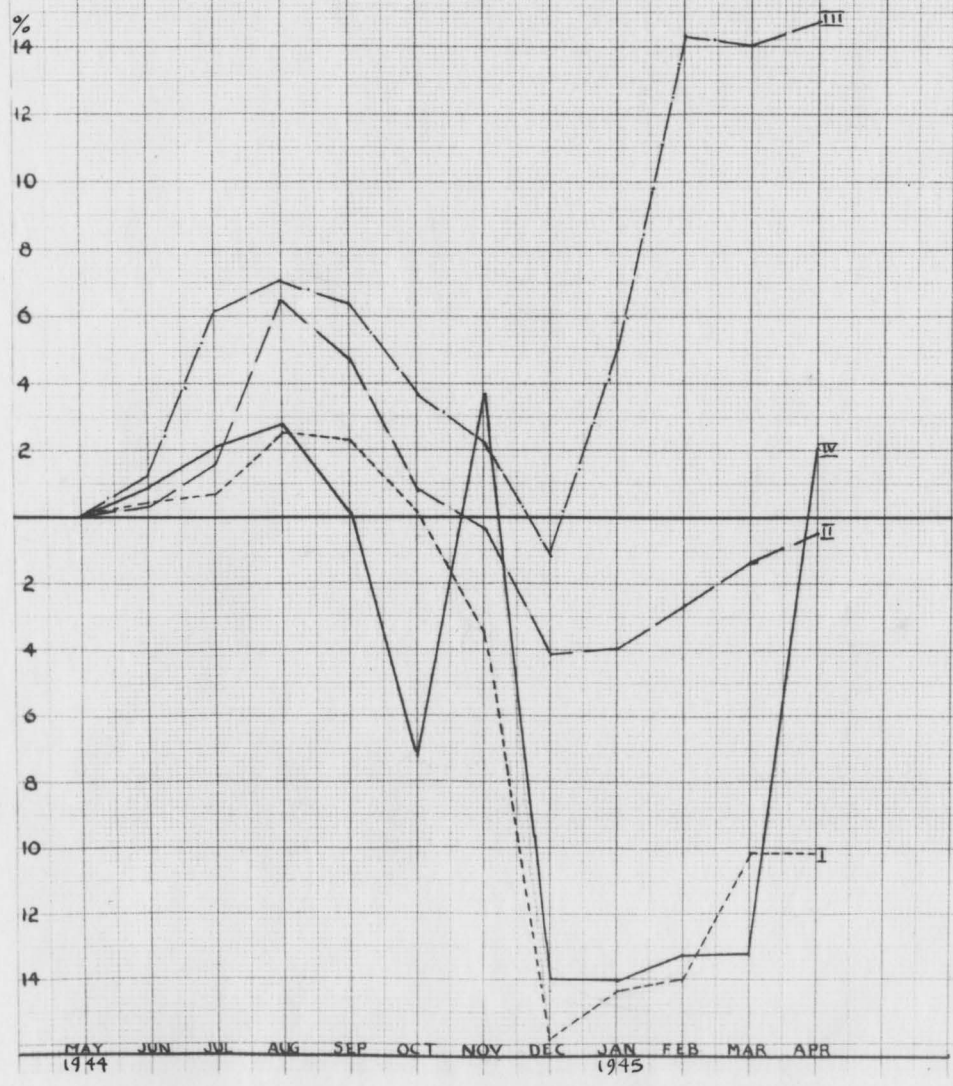
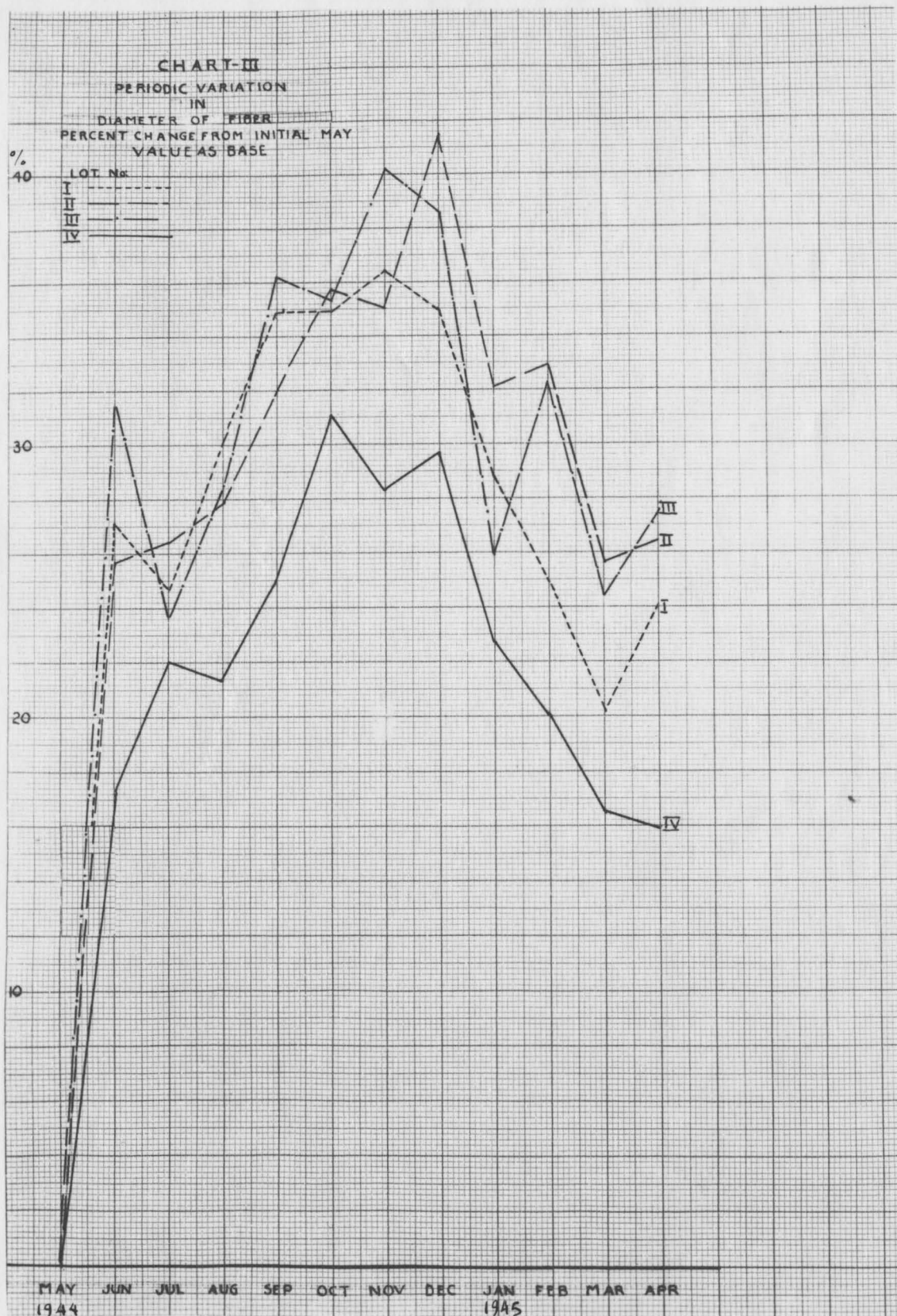
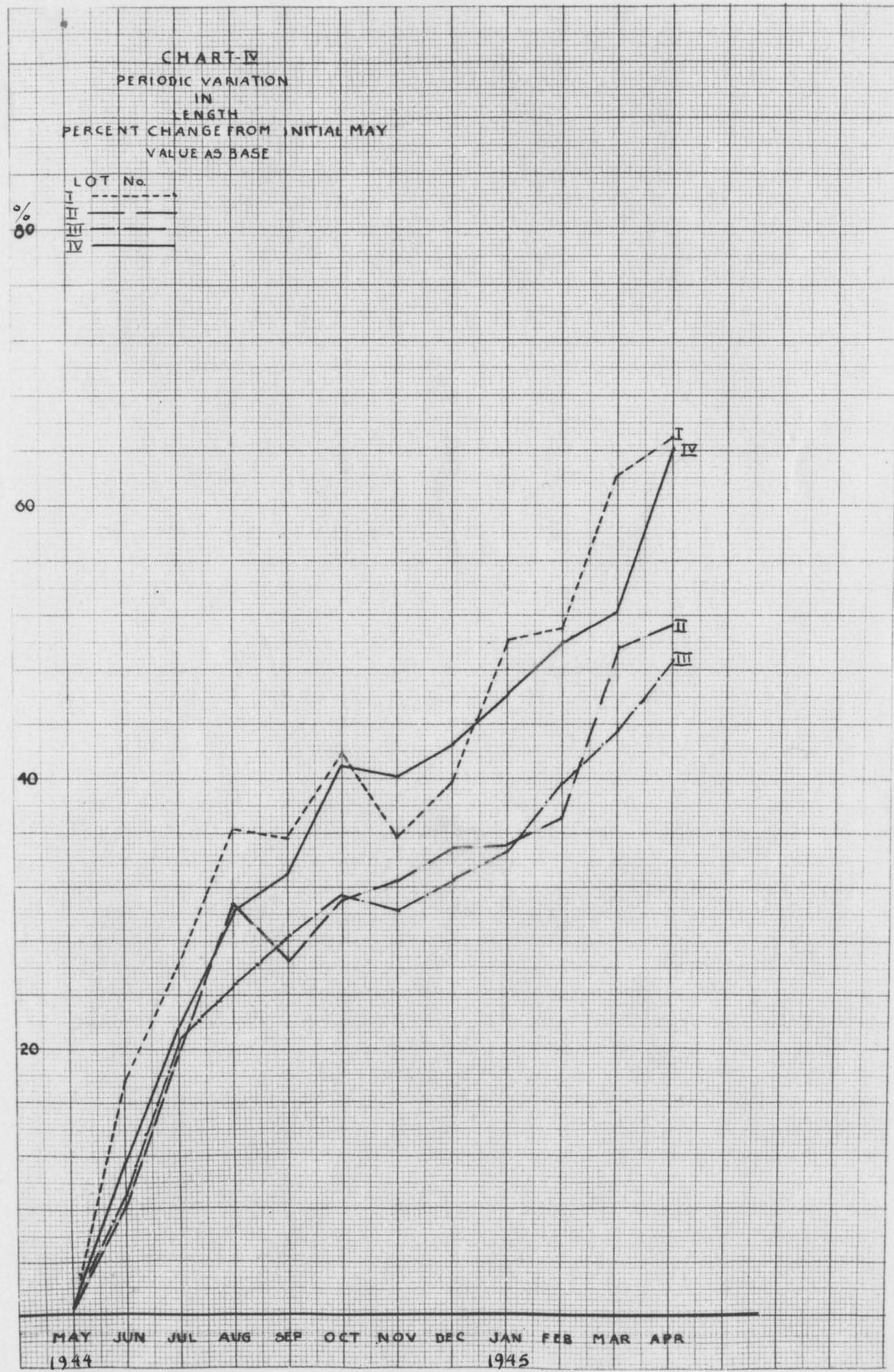


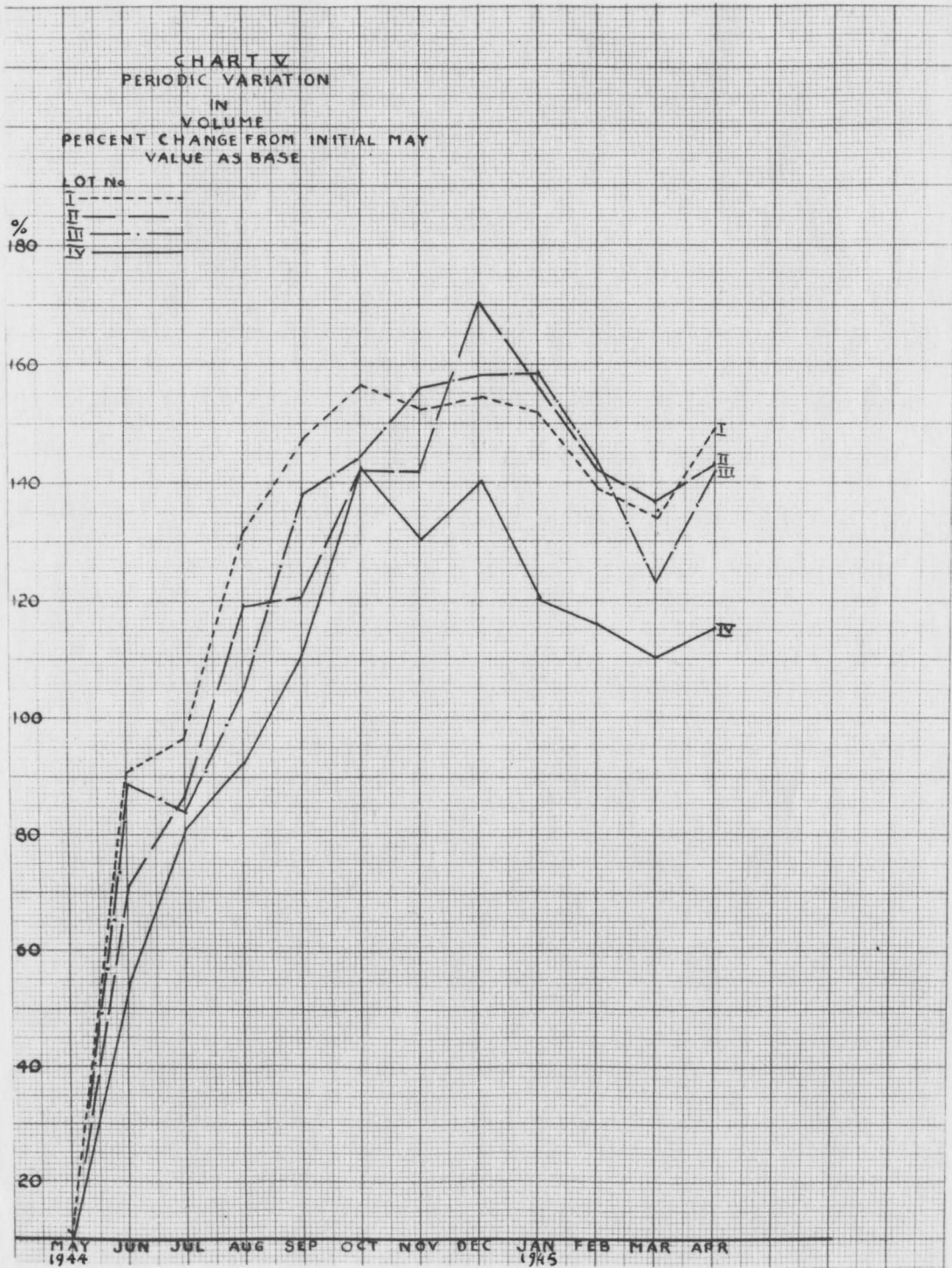
CHART II
PERIODIC VARIATION
IN
SALT CONTENT
PERCENT CHANGE FROM INITIAL MAY
VALUE AS BASE

LOT No
I -----
II -----
III -----
IV -----









The reason for the constantly increasing fiber length is not clear. While it may be due to the effect of periodic shaving, data obtained in this study are insufficient to justify such an explanation. Furthermore, it is commonly believed that periodic cutting or shaving does not stimulate the growth of hair or wool.

Grease and Suint: Charts I and II indicate that grease production paralleled fiber diameter change, showing a maximum in the cold months and a minimum during warm months. Suint secretion however, presented a reversed pattern, being highest in the warm months and reaching a minimum in the winter. Protamone feeding induced a greater secretion of both grease and suint salts.

Total Annual Wool Yield: The production of clean wool for 1944-45 was increased in all lots above that produced in 1943-44. This was probably due to the fact that all the animals were on a higher plane of nutrition. During the experiment the animals were also confined in smaller quarters, and had not the opportunity to exercise as they did during the year prior to the experiment. It seems logical to assume that reduction of muscular activity would insure more nutrient for wool production, although the common opinion among farmers is that exercise stimulates wool growth. As shown in table 3, wool production was increased in proportion to the amount of protamone fed.

Table 3. Wool Production - Composite Table

Lot Number	I		II		III		IV
Calculated Metabolic Increase	5%		10%		15%		None (control)
	a	b	a	b	a	b	a
Clean wool. 1943-44. Total gms.	2254.1		2665.3		2141.9		2538.2
Clean wool. 1944-45. Total gms.	2558.0		3108.3		2891.9		2912.8
Clean wool. Increase, gms.	303.9		443.0		750.0		374.6
Clean wool. Increase, percent	13.5	-8.7	16.2	9.9	35.0	137.3	14.8
Grease, percent	18.6	4.3	20.2	13.2	22.0	23.7	17.8
Suint, percent	16.5	8.5	17.9	17.6	18.3	20.6	15.9

a - Absolute values. Average for one year.

b - Percentage increase or decrease from values of control lot No. IV.

SUMMARY AND CONCLUSIONS

Three year old Rambouillet ewes, immediately following shearing in the spring of 1944, were placed on an experiment planned to study the effect of protamone feeding on metabolism and wool production. Three lots of four animals each were fed protamone in the amounts of 0.5 gm., 1.0 gm., and 1.5 gms. per ewe per day respectively. One lot of four animals served as a control and received no protamone.

Measurements of wool fiber length, diameter, grease, and suint were made on small samples shaven from a shoulder area of each ewe every 28 days. Data for the utilization by the animals of dry matter, nitrogen, ash, calcium, and phosphorous were obtained by methods used by the Animal Nutrition Laboratory. Respiratory and heart rates were also recorded periodically.

Data obtained for cardio-respiratory activity, feed and water consumption, and nitrogen, calcium and phosphorous retention, justify the conclusion that protamone feeding increased the metabolic rate of the animals. Observations made on small, periodically-shaven wool samples as well as total annual fleece yield also lead to the conclusion that wool, grease, and suint production were increased in proportion to the level of protamone fed.

APPENDIX

Table 4.

Ewe Weights

First Balance Trial*

Lot No.	Ewe No.	10-2-44 Start	10-13-44 Middle	10-29-44 End	Weight Loss lbs.
1	144	164.33	157.33	156.66	7.67
	76	166.66	161.66	160.00	6.66
2	114	159.33	155.00	152.33	7.00
	143	169.00	161.00	160.00	9.00
3	80	170.66	167.00	153.66	7.00
	66	160.33	156.66	154.33	6.00
4	93	168.50	157.66	155.00	13.50
	131	153.33	148.00	149.00	4.00

* Average weight for three days.

Table 5.

Ewe Weights
Second Balance Trial*

Lot No.	Ewe No.	11-20-44	12-14-44	Weight Loss ^o
		Start	End	
1		lbs.	lbs.	lbs.
	144	168.33	162.00	6.33
	76	169.00	167.00	2.00
2	114	158.33	156.50	1.83
	143	174.00	170.33	3.67
3	80	162.00	156.00	6.00
	66	158.00	154.00	4.00
4	93	169.50	167.00	2.00
	131	155.66	145.00	10.00

* Average weight for three days.

^o Because of snow, no weighings were made at middle of trial.

Table 6.

Ewe Weights

Third Balance Trial*

Lot No.	Ewe No.	3-12-45 Start lbs.	3-25-45 Middle lbs.	4-5-45 End lbs.	Gain lbs.
1	144	199.0	198.66	200.50	1.34
	76	186.0	190.00	195.00	5.00
2	114	186.33	190.33	196.25	4.92
	143	192.00	194.50	200.00	5.50
3	80	190.66	194.33	204.50	10.17
	66	180.66	197.00	200.50	3.50
4	93	185.00	187.00	195.00	8.00
	131	188.00	190.66	202.50	11.84

* Average weight for three days

Table 7.

Birth Weight of Lambs

Lot No.	Ewe No.	Date	1944	Date	1945
			Weight of lambs lbs.		Weight of lambs lbs.
1	144	3-14	13.5	5-25	8.8
			15.4		9.8
	76	3-27	12.0	5-29	11.6
	132	3-20	8.0	5-18	8.0
			7.2		10.0
	148	3-29	12.2	5-30	9.0
				11.0	
Average			11.38		9.74
2	114	3-14	12.0	5-29	8.5
			Died		7.5
	143	3-21	9.1	5-22	11.2
			10.7		11.4
	108	3-21	12.2	Dead Twins - Pregnancy Disease	
	118	3-27	8.6	5-25	13.0
Average			10.5		10.32

Table 7 (cont.)

Birth Weight of Lambs
(continued)

Lot No.	Ewe No.	1944		1945	
		Date	Weight of lambs lbs.	Date	Weight of lambs lbs.
3	80	3-26	11.3	5-19	8.0
			8.1		9.0
	66	3-17	10.7	5-29	8.5
			10.9		8.0
	52		Dead Twins		---
	64	3-25	9.5	5-31	9.5
Average			<u>10.2</u>		<u>9.0</u>
			10.12		8.67
4	93	3-28	7.9	5-17	5.9
			7.2		8.7
	131	3-26	9.0	5-31	8.5
			Died		8.5
	54	3-27	10.2	5-27	11.0
			7.6		---
	129	3-25	11.6	5-28	9.0
Average			<u>8.92</u>		<u>9.5</u>
					8.73

Table 8.

Protamone Feeding Experiment
Heart Rate Per Minute

Lot	Ewe	10-1-44	10-15	11-1	11-15	12-1	12-16
1	144	80	80	78	80	80	78
	76	88	84	86	86	84	82
	132	84	80	82	84	82	80
	148	<u>82</u>	<u>82</u>	<u>80</u>	<u>84</u>	<u>82</u>	<u>80</u>
Ave.		83.5	81.5	81.5	83.5	82.0	80.0
2	114	92	86	88	88	86	86
	143	84	84	84	82	86	84
	108	88	84	86	88	86	86
	118	<u>90</u>	<u>82</u>	<u>88</u>	<u>84</u>	<u>86</u>	<u>86</u>
Ave.		88.5	84.0	86.5	85.5	86.0	85.5
3	80	80	80	84	86	86	84
	66	92	94	96	92	94	90
	52	90	92	92	94	90	86
	64	<u>86</u>	<u>88</u>	<u>88</u>	<u>87</u>	<u>90</u>	<u>88</u>
Ave.		87.0	88.5	90.0	90.0	90.0	87.0
4	93	72	60	68	70	72	74
	131	68	60	64	66	64	62
	54	70	62	64	62	66	62
	129	<u>69</u>	<u>60</u>	<u>65</u>	<u>64</u>	<u>66</u>	<u>62</u>
Ave.		70.0	60.5	65.0	65.5	67.0	65.0

Table 8 (cont.)

Protamone Feeding Experiment
Heart Rate Per Minute
(continued)

Lot	Ewe	1-1-45	1-16	2-1	2-16	3-1	3-16	4-2	4-18	5-3
1	144	80	76	60	62	60	64	63	64	66
	76	82	86	66	64	66	65	64	65	68
	132	78	76	70	72	70	68	66	66	68
	148	<u>80</u>	<u>76</u>	<u>72</u>	<u>74</u>	<u>75</u>	<u>72</u>	<u>70</u>	<u>70</u>	<u>71</u>
Ave .		80.0	78.5	67.0	68.0	68.0	67.3	66.0	66.0	68.0
2	114	82	82	103	100	103	98	96	98	94
	143	80	80	110	102	110	100	98	100	92
	108	100	83	116	112	116	98	94	94	93
	118	<u>82</u>	<u>81</u>	<u>118</u>	<u>110</u>	<u>118</u>	<u>102</u>	<u>100</u>	<u>96</u>	<u>94</u>
Ave .		86.0	81.5	111.8	106.0	111.8	99.5	97.0	97.0	93.3
3	80	82	84	84	86	84	88	90	88	90
	66	127	86	116	114	116	118	116	114	116
	52	84	80	82	84	82	84	82	86	86
	64	<u>86</u>	<u>82</u>	<u>116</u>	<u>114</u>	<u>116</u>	<u>117</u>	<u>114</u>	<u>116</u>	<u>112</u>
Ave .		95.0	83.0	99.5	99.5	99.5	101.8	101.0	101.0	101.0
4	93	72	76	62	62	64	62	64	62	64
	131	60	60	64	66	66	64	66	64	62
	54	60	62	60	62	62	64	62	66	64
	129	<u>62</u>	<u>60</u>	<u>62</u>	<u>64</u>	<u>66</u>	<u>62</u>	<u>64</u>	<u>66</u>	<u>64</u>
Ave .		63.5	63.5	62.0	63.5	64.5	63.0	64.0	64.0	64.0

Table 9.

Protamone Feeding Experiment
Respiration Rate Per Minute

Lot	Ewe	1944				1945										
		10-1	10-16	11-1	11-16	12-1	12-16	1-1	1-16	2-1	2-16	3-2	3-16	4-3	4-18	5-3
1	144	28	27	29	26	27	28	27	26	26	24	38	36	34	36	34
	76	28	27	26	29	27	26	29	26	27	26	29	30	28	32	32
	132	26	26	27	26	27	26	26	26	25	26	40	38	36	34	34
	148	<u>28</u>	<u>29</u>	<u>27</u>	<u>28</u>	<u>30</u>	<u>26</u>	<u>26</u>	<u>24</u>	<u>24</u>	<u>25</u>	<u>56</u>	<u>48</u>	<u>46</u>	<u>46</u>	<u>42</u>
	Ave.	28.5	27.3	27.0	27.0	27.8	26.5	27.0	25.5	25.5	25.3	40.8	38.0	36.0	37.0	35.5
2	114	36	36	35	36	34	32	28	24	25	25	40	38	42	40	42
	143	40	38	38	37	37	36	26	26	24	26	48	46	46	44	46
	108	38	36	36	34	28	24	22	26	26	26	38	40	38	40	40
	118	<u>40</u>	<u>39</u>	<u>37</u>	<u>37</u>	<u>35</u>	<u>28</u>	<u>24</u>	<u>24</u>	<u>25</u>	<u>24</u>	<u>56</u>	<u>48</u>	<u>46</u>	<u>44</u>	<u>42</u>
	Ave.	38.5	37.2	36.5	36.	33.5	30.0	25.0	25.0	25.0	25.0	45.5	43.0	43.0	42.0	42.5
3	80	40	40	36	38	37	31	26	28	27	27	39	42	40	46	46
	66	39	41	39	39	40	37	31	30	26	28	52	48	48	48	48
	52	41	40	38	39	39	33	28	28	25	26	36	38	40	38	40
	64	<u>39</u>	<u>39</u>	<u>39</u>	<u>37</u>	<u>33</u>	<u>30</u>	<u>26</u>	<u>26</u>	<u>26</u>	<u>27</u>	<u>36</u>	<u>38</u>	<u>40</u>	<u>40</u>	<u>42</u>
	Ave.	40.0	40.0	38.0	38.3	37.0	33.0	28.0	28.0	26.0	27.0	41.0	42.0	42.0	43.0	44.0
4	93	28	26	22	23	23	22	20	22	22	23	26	26	28	26	26
	131	28	26	24	25	22	20	20	20	20	20	28	24	26	28	26
	54	26	24	26	22	21	20	18	18	21	20	26	24	22	26	28
	129	<u>26</u>	<u>26</u>	<u>22</u>	<u>23</u>	<u>22</u>	<u>21</u>	<u>18</u>	<u>18</u>	<u>19</u>	<u>20</u>	<u>24</u>	<u>22</u>	<u>24</u>	<u>24</u>	<u>26</u>
	Ave.	27.0	26.0	24.0	23.0	22.0	21.0	19.0	20.0	21.0	21.0	26.0	24.0	25.0	26.0	27.0

Table 10.

Protamone Feeding Experiment
Temperature Rate*

Lot	Ewe	10-1-44	10-16	11-1	11-16	12-1	12-16
1	144	102.1	102.2	102.1	102.3	102.3	102.1
	76	102.6	102.6	102.5	102.4	102.5	102.4
	132	102.5	102.6	102.4	102.5	102.6	102.6
	148	<u>102.0</u>	<u>102.0</u>	<u>102.1</u>	<u>102.1</u>	<u>102.3</u>	<u>102.2</u>
	Ave.	102.3	102.3	102.3	102.3	102.4	102.3
2	114	102.0	102.1	102.0	102.1	102.0	102.3
	143	101.6	102.0	102.0	101.9	102.0	102.1
	108	102.4	102.4	102.3	102.1	102.3	102.4
	118	<u>102.0</u>	<u>102.1</u>	<u>102.1</u>	<u>102.2</u>	<u>102.3</u>	<u>102.4</u>
	Ave.	102.3	102.2	102.1	102.3	102.2	102.3
3	80	102.0	102.0	101.9	101.8	102.1	102.2
	66	102.6	102.3	102.4	102.5	102.3	102.1
	52	101.9	102.1	102.0	102.3	102.4	102.3
	64	<u>102.6</u>	<u>102.6</u>	<u>102.4</u>	<u>102.3</u>	<u>102.5</u>	<u>102.4</u>
	Ave.	102.5	102.3	102.4	102.5	102.3	102.3
4	93	102.0	102.1	102.2	102.1	102.4	102.3
	131	102.4	102.3	102.4	102.3	102.3	102.2
	54	102.1	102.0	102.0	102.1	102.1	102.3
	129	<u>102.3</u>	<u>102.3</u>	<u>102.3</u>	<u>102.1</u>	<u>102.1</u>	<u>102.3</u>
	Ave.	102.2	102.2	102.2	102.2	102.2	102.3

* Rectal

Table 10 (cont.)

Protamone Feeding Experiment
Temperature Rate*
(continued)

Lot	Ewe	1-2-45	1-16	2-1	2-16	3-1	3-16	4-1	4-16	5-1
1	144	102.2	102.4	102.4	102.1	102.1	102.2	102.1	102.1	102.2
	76	102.4	102.4	102.5	102.3	102.3	102.2	102.2	102.3	102.2
	132	102.5	102.4	102.5	102.4	102.0	102.0	102.5	102.4	102.3
	148	<u>102.2</u>	<u>102.3</u>	<u>102.1</u>	<u>102.1</u>	<u>102.1</u>	<u>102.1</u>	<u>102.0</u>	<u>102.1</u>	<u>102.1</u>
	Ave.	102.3	102.4	102.3	102.2	102.1	102.2	102.2	102.2	102.2
2	114	102.1	102.2	102.0	102.1	102.1	102.0	102.2	102.2	102.1
	143	101.9	102.1	102.1	102.1	102.0	102.0	102.1	102.1	102.1
	108	102.4	102.1	102.3	102.1	102.1	102.2	102.1	102.1	102.2
	118	<u>102.3</u>	<u>102.1</u>	<u>102.2</u>	<u>102.1</u>	<u>102.3</u>	<u>102.3</u>	<u>102.3</u>	<u>102.1</u>	<u>102.1</u>
	Ave.	102.4	102.1	102.2	102.1	102.1	102.1	102.2	102.1	102.1
3	80	102.0	102.1	102.1	102.2	102.3	102.1	102.3	102.2	102.1
	66	102.2	102.2	102.5	102.1	102.2	102.1	102.1	102.1	102.2
	52	102.4	102.4	102.3	102.4	102.1	102.2	102.1	102.3	102.1
	64	<u>102.3</u>	<u>102.4</u>	<u>102.3</u>	<u>102.1</u>	<u>102.0</u>	<u>102.3</u>	<u>102.1</u>	<u>102.0</u>	<u>102.2</u>
	Ave.	102.3	102.3	102.3	102.2	102.2	102.2	102.1	102.2	102.2
4	93	102.1	102.1	102.2	102.2	102.1	102.1	102.3	102.1	102.2
	131	102.3	102.4	102.3	102.1	102.0	102.0	102.1	102.3	102.2
	54	102.3	102.1	102.1	102.0	102.0	102.0	102.3	102.0	102.1
	129	<u>102.1</u>	<u>102.3</u>	<u>102.1</u>	<u>102.1</u>	<u>102.1</u>	<u>102.1</u>	<u>102.3</u>	<u>102.1</u>	<u>102.0</u>
	Ave.	102.2	102.2	102.2	102.1	102.1	102.1	102.2	102.1	102.1

* Rectal

Table 11.

Chemical Analyses of Feeds
1944-1945

Trial		Moisture %	D. M. %	Milligram Per Gram Dry Matter			
				Ash gms.	Nitrogen	Calcium	Phosphorous
1st.	Hay	8.53	91.47	.0897	23.36	7.83	2.36
	Hay Refuse	13.90	86.10	.0666	12.72	5.13	1.17
	Grain	7.55	92.45	.0587	31.42	.57	5.89
2nd.	Hay	10.96	89.04	.0932	24.88	8.75	2.74
	Hay Refuse	10.10	80.90	.0722	14.27	6.49	2.15
	Grain	9.52	90.48	.0474	27.60	.62	5.70
3rd.	Hay	22.27	77.73	.0946	16.26	9.40	2.56
	Hay Refuse	15.43	84.57	.1081	17.71	9.16	2.66
	Grain	14.77	85.23	.0430	21.02	.52	5.76

Table 12.

First Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in GramsLot 1
Ewe 144

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
10-3-44	1000	55	945	681	7765	4710	3055	1155	776
10-4-44	1000	28	972	681	7500	3115	4385	1051	1151
10-5-44	1000	10	990	681	8000	4420	3580	1346	691
10-6-44	1000	35	965	681	8000	5545	2455	1296	1801
10-7-44	1000	55	945	681	8000	4970	3030	1131	3121
10-8-44	1000	30	970	681	8000	1305	6695	1426	2101
10-9-44	1000	60	940	681	8000	860	7140	1076	1301
10-10-44	1000	200	800	681	8000	2790	5210	1146	2064
10-11-44	1000	210	790	681	8000	4880	3120	-----	-----
10-12-44	1000	---	1000	681	4000	840	3160	1726	1461
10-16-44	1000	30	970	681	4000	860	3140	1096	1601
10-17-44	1000	45	955	681	8000	4065	3935	1386	1181
10-19-44	1000	83	917	681	4000	920	3080	1446	928
10-20-44	1000	24	976	681	8000	2107	5893	1089	1122
10-21-44	1000	4	996	681	8000	2916	5084	1671	1761
10-22-44	1000	---	1000	681	8000	4062	3938	1466	1331
10-23-44	1000	12	988	681	8000	3492	4508	1511	1051
10-24-44	1000	---	1000	681	8000	3842	4158	1365	1756
10-25-44	1000	120	880	681	8000	4637	3363	1504	1475
10-26-44	<u>1000</u>	<u>66</u>	<u>934</u>	<u>681</u>	<u>8000</u>	<u>3616</u>	<u>4384</u>	<u>1100</u>	<u>1731</u>
Total	20000	1067	18933	13620	147265	63952	83313	24987	26604
Average	1000	53.4	946.7	681.0	7363.3	3197.6	4165.7	1249.4	1330.2

Table 13.

Second Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in GramsLot 1
Ewe 144

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
11-21-44	1000	—	1000	681	4000	3500	500	1541	2226
11-22-44	1000	21	979	681	6500	1850	4650	1196	891
11-23-44	1000	32	968	681	7000	4220	2780	1696	1286
11-24-44	1000	17	983	681	7000	3625	3375	1293	1014
11-25-44	1000	26	974	681	7000	4110	2890	2111	1731
11-26-44	1000	42	958	681	4000	1135	2865	926	1461
11-27-44	1000	34	966	681	7000	3845	3155	1521	1001
11-28-44	1000	12	988	681	7000	4290	2710	1316	1256
11-29-44	1000	27	973	681	7000	5125	1875	1561	1233
11-30-44	1000	41	959	681	4000	1080	2920	1172	1341
12-5-44	1000	16	984	681	8000	5842	2158	1446	2064
12-6-44	1000	21	979	681	7000	4660	2340	1416	1201
12-7-44	1000	13	987	681	7000	3725	3275	1416	1571
12-8-44	1000	37	963	681	7000	3610	3390	1046	1234
12-9-44	1000	55	945	681	7000	4580	2420	1460	1091
12-10-44	1000	22	978	681	4000	1690	2310	1076	783
12-11-44	1000	41	959	681	7000	3870	3130	1634	1272
12-12-44	1000	16	984	681	7000	3875	3125	1308	993
12-13-44	1000	19	981	681	7000	3865	3135	1481	1331
12-14-44	<u>1000</u>	<u>35</u>	<u>965</u>	<u>681</u>	<u>7000</u>	<u>4170</u>	<u>2830</u>	<u>1471</u>	<u>1476</u>
Total	20000	527	19473	13620	128500	72667	55833	28087	26456
Average	1000	26.4	973.6	681.0	6425.0	3633.4	2791.7	1404.4	1322.8

Table 14.

Third Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in Grams

Lot 1

Ewe 144

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
3-13-45	1000	5	995	681	7000	2390	4610	1096	1052
3-14-45	1000	10	990	681	7000	2580	4420	1326	1642
3-15-45	1000	52	948	681	7000	3160	3840	1326	1692
3-16-45	1000	46	954	681	7000	3735	3265	1316	1902
3-17-45	1000	38	962	681	7000	3190	3810	1346	1719
3-18-45	1000	56	944	681	7000	2940	4060	816	1242
3-19-45	1000	54	946	681	7000	3950	3050	1406	1442
3-20-45	1000	48	952	681	7000	3200	3800	1256	1622
3-21-45	1000	46	954	681	7000	2845	4155	1166	1222
3-22-45	1000	40	960	681	7000	3150	3850	1181	1352
3-27-45	1000	38	962	681	7000	4680	2320	906	2422
3-28-45	1000	106	894	681	7000	2840	4160	846	1132
3-29-45	1000	124	876	681	7000	3520	3480	1406	1720
3-30-45	1000	112	888	681	7000	3090	3910	1116	1122
3-31-45	1000	102	898	681	7000	3450	3550	1001	1172
4-1-45	1000	94	906	681	7000	3890	3110	1086	1260
4-2-45	1000	92	908	681	7000	4045	2955	1116	1202
4-3-45	1000	101	899	681	7000	4990	2010	1182	1157
4-4-45	1000	104	896	681	7000	3640	3360	1246	1587
4-5-45	<u>1000</u>	<u>105</u>	<u>895</u>	<u>681</u>	<u>7000</u>	<u>3275</u>	<u>3725</u>	<u>961</u>	<u>1274</u>
Total	20000	1373	18627	13620	140000	68560	71440	23101	28935
Average	1000	68.7	931.4	681.0	7000.0	3428.0	3572.0	1155.1	1446.7

Table 15.

First Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in GramsLot 1
Ewe 76

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
10-3-44	1000	25	975	681	7640	4490	3150	1064	838
10-4-44	1000	55	945	681	7500	4470	3030	1120	1083
10-5-44	1000	50	950	681	8000	5635	2365	1070	1228
10-6-44	1000	70	930	681	8000	6040	1960	1080	1163
10-7-44	1000	70	930	681	8000	4780	3220	1205	1098
10-8-44	1000	140	860	681	8000	2930	5070	1460	1453
10-9-44	1000	180	820	681	8000	4910	3090	995	1273
10-10-44	1000	215	785	681	8000	3420	4580	967	1206
10-11-44	1000	290	710	681	8000	5610	2390	----	----
10-12-44	1000	---	1000	681	4000	2840	1160	1470	1063
10-16-44	1000	90	910	681	4000	1150	2850	1200	1438
10-17-44	1000	40	960	681	8000	4356	3644	1270	1073
10-19-44	1000	118	882	681	4000	1685	2315	1270	927
10-20-44	1000	57	943	681	8000	3255	4745	1214	1005
10-21-44	1000	38	962	681	8000	2756	5244	1505	1422
10-22-44	1000	38	962	681	8000	5352	2648	1236	855
10-23-44	1000	14	986	681	8000	4627	3373	1152	1242
10-24-44	1000	21	979	681	8000	6914	1086	1255	1072
10-25-44	1000	27	973	681	8000	4899	3101	1250	983
10-26-44	<u>1000</u>	<u>43</u>	<u>957</u>	<u>681</u>	<u>8000</u>	<u>4303</u>	<u>3697</u>	<u>1167</u>	<u>963</u>
Total	20000	1581	18419	13620	147140	84422	62718	22951	21385
Average	1000	79.1	920.9	681.0	7357.0	4221.1	3135.9	1147.6	1069.3

Table 16.

Second Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in Grams

Lot 1

Ewe 76

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
11-21-44	1000	--	1000	681	4000	3309	691	1510	943
11-22-44	1000	37	963	681	7000	3805	3195	1270	958
11-23-44	1000	42	958	681	7000	4450	2550	1704	870
11-24-44	1000	33	967	681	7000	4715	2285	1086	1183
11-25-44	1000	27	973	681	7000	4995	2005	1291	1183
11-26-44	1000	46	954	681	4000	2845	1155	990	913
11-27-44	1000	39	961	681	7000	2950	4050	1192	928
11-28-44	1000	56	944	681	7000	5290	1710	1282	1298
11-29-44	1000	53	947	681	7000	5205	1795	1430	1000
11-30-44	1000	23	977	681	4000	1960	2040	1082	1013
12-5-44	1000	34	966	681	8000	6590	1410	1187	893
12-6-44	1000	40	960	681	7000	4500	2500	1202	903
12-7-44	1000	37	963	681	7000	4390	2610	1155	1020
12-8-44	1000	83	917	681	7000	4345	2655	1060	1073
12-9-44	1000	107	893	681	7000	4090	2910	1120	1053
12-10-44	1000	102	898	681	4000	3090	910	1008	885
12-11-44	1000	105	895	681	7000	2950	4050	1423	1105
12-12-44	1000	121	879	681	7000	5435	1565	1333	944
12-13-44	1000	86	914	681	7000	4370	2630	1188	1123
12-14-44	<u>1000</u>	<u>73</u>	<u>927</u>	<u>681</u>	<u>7000</u>	<u>4364</u>	<u>2636</u>	<u>1195</u>	<u>1013</u>
Total	20000	1144	18856	13620	129000	83648	45352	24708	20301
Average	1000	57.2	942.8	681.0	6450.0	4182.4	2267.6	1235.4	1015.1

Table 17.

Third Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in GramsLot 1
Ewe 76

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
3-13-45	1000	120	880	681	7000	4705	2295	1435	773
3-14-45	1000	150	850	681	7000	4380	2620	1405	1458
3-15-45	1000	132	868	681	7000	3870	3130	1344	1088
3-16-45	1000	140	860	681	7000	4605	2395	1070	958
3-17-45	1000	112	888	681	7000	4470	2530	1060	993
3-18-45	1000	118	882	681	7000	3880	3120	845	1358
3-19-45	1000	126	874	681	7000	5350	1650	1175	838
3-20-45	1000	134	866	681	7000	4565	2435	820	848
3-21-45	1000	141	859	681	7000	3585	3415	850	978
3-22-45	1000	136	864	681	7000	4280	2720	945	850
3-27-45	1000	246	754	681	7000	5550	1450	460	628
3-28-45	1000	264	736	681	7000	3890	3110	805	648
3-29-45	1000	214	786	681	7000	3620	3380	1170	756
3-30-45	1000	247	753	681	7000	3980	3020	1053	654
3-31-45	1000	252	748	681	7000	4140	2860	970	758
4-1-45	1000	257	743	681	7000	4320	2680	950	705
4-2-45	1000	211	789	681	7000	4790	2210	1012	708
4-3-45	1000	216	784	681	7000	5365	1635	918	928
4-4-45	1000	281	719	681	7000	4065	2935	990	693
4-5-45	<u>1000</u>	<u>266</u>	<u>734</u>	<u>681</u>	<u>7000</u>	<u>4325</u>	<u>2675</u>	<u>956</u>	<u>855</u>
Total	20000	3763	16237	13620	140000	87735	52265	20233	17475
Average	1000	188.2	811.9	681.0	7000	4386.8	2613.3	1011.7	873.8

Table 18.

First Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in GramsLot 2
Ewe 114

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
10-3-44	1000	15	985	681	7620	3745	3875	1335	1387
10-4-44	1000	35	965	681	7500	3855	3845	1300	1462
10-5-44	1000	20	980	681	8000	4290	3710	1310	1592
10-6-44	1000	20	980	681	8000	5010	2990	1295	1652
10-7-44	1000	15	985	681	8000	5010	2990	1205	1552
10-8-44	1000	30	970	681	8000	1200	6800	1500	2162
10-9-44	1000	110	890	681	8000	4875	3125	1050	1722
10-10-44	1000	215	785	681	8000	1835	6165	1265	2019
10-11-44	1000	120	880	681	12000	8940	3060	----	----
10-12-44	1000	---	1000	681	4000	920	3080	1560	1502
10-16-44	1000	50	950	681	4000	3400	600	1810	1937
10-17-44	1000	75	925	681	8000	4010	3990	1240	1647
10-19-44	1000	89	911	681	8000	3045	4955	1655	1301
10-20-44	1000	60	940	681	8000	3218	4782	1442	1069
10-21-44	1000	34	966	681	8000	2366	5634	1540	2407
10-22-44	1000	93	907	681	8000	4824	3176	1225	1098
10-23-44	1000	109	891	681	8000	5172	2828	1173	1446
10-24-44	1000	31	969	681	8000	6069	1931	1175	1572
10-25-44	1000	41	959	681	8000	3839	4161	1223	1232
10-26-44	<u>1000</u>	<u>64</u>	<u>936</u>	<u>681</u>	<u>8000</u>	<u>3705</u>	<u>4295</u>	<u>1117</u>	<u>1424</u>
Total	20000	1226	18774	13620	155120	79328	75792	25420	30183
Average	1000	61.3	938.7	681.0	7756.0	3966.4	3789.6	1271.0	1509.2

Table 19.

Second Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in Grams

Lot 2

Ewe 114

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
11-21-44	1000	—	1000	681	4000	3560	440	1766	1435
11-22-44	1000	112	888	681	6560	3315	3245	1174	1312
11-23-44	1000	131	869	681	7000	4415	2585	1495	1637
11-24-44	1000	162	838	681	7000	3920	3080	1255	1002
11-25-44	1000	117	883	681	7000	4912	2088	1345	1442
11-26-44	1000	173	827	681	4000	2435	1565	766	922
11-27-44	1000	111	889	681	7000	5450	1550	1222	1047
11-28-44	1000	114	886	681	7000	3255	3745	1023	1157
11-29-44	1000	132	868	681	7000	4650	2350	1129	1207
11-30-44	1000	107	893	681	4000	2040	1960	938	996
12-5-44	1000	103	897	681	8000	7030	970	1220	1327
12-6-44	1000	122	878	681	7000	2640	4360	1105	1547
12-7-44	1000	127	873	681	7000	2937	4063	1326	1584
12-8-44	1000	131	869	681	7000	4770	2230	1026	1282
12-9-44	1000	254	746	681	7000	3475	3525	1235	1467
12-10-44	1000	221	779	681	4000	1380	2620	972	1163
12-11-44	1000	192	808	681	7000	3922	3078	1512	1332
12-12-44	1000	197	803	681	7000	4490	2510	1253	1514
12-13-44	1000	217	783	681	7000	4130	2870	1340	1262
12-14-44	<u>1000</u>	<u>225</u>	<u>775</u>	<u>681</u>	<u>7000</u>	<u>5240</u>	<u>1760</u>	<u>1280</u>	<u>1332</u>
Total	20000	2948	17052	13620	128560	77966	50594	24382	25967
Average	1000	147.4	852.6	681.0	6428.0	3898.3	2529.7	1219.1	1298.4

Table 20.

Third Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in GramsLot 2
Ewe 114

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
3-13-45	1000	10	990	681	7000	3660	3340	855	1301
3-14-45	1000	20	980	681	7000	2895	4105	900	1521
3-15-45	1000	38	962	681	7000	2035	4965	954	1431
3-16-45	1000	46	954	681	7000	2870	4130	1170	1561
3-17-45	1000	52	948	681	7000	2610	4390	1170	1896
3-18-45	1000	47	953	681	7000	3205	3795	1115	2016
3-19-45	1000	51	949	681	7000	3355	3645	1250	1791
3-20-45	1000	42	958	681	7000	2765	4235	1230	1806
3-21-45	1000	38	962	681	7000	5800	1200	1040	1811
3-22-45	1000	42	958	681	7000	2605	4395	1115	1706
3-27-45	1000	208	792	681	7000	4975	2025	1040	1396
3-28-45	1000	204	796	681	7000	2950	4050	900	1361
3-29-45	1000	186	814	681	7000	2720	4280	1220	1818
3-30-45	1000	221	779	681	7000	3485	3515	1152	1351
3-31-45	1000	217	783	681	7000	3410	3590	922	1366
4-1-45	1000	196	804	681	7000	4365	2635	1130	1371
4-2-45	1000	198	802	681	7000	4305	2695	910	1231
4-3-45	1000	186	814	681	7000	3770	3230	781	941
4-4-45	1000	201	799	681	7000	4990	2010	900	1306
4-5-45	<u>1000</u>	<u>204</u>	<u>796</u>	<u>681</u>	<u>7000</u>	<u>2360</u>	<u>4640</u>	<u>746</u>	<u>1173</u>
Total	20000	2407	17593	13620	140000	69130	70870	20500	30154
Average	1000	120.4	879.7	681.0	7000	3456.5	3543.5	1025.0	1507.7

Table 21.

First Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in Grams

Lot 2

Ewe 143

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
10-3-44	1000	2	998	681	8110	3895	4215	1185	1105
10-4-44	1000	5	995	681	7500	3490	4010	1270	1830
10-5-44	1000	5	995	681	8000	3545	4455	1120	1850
10-6-44	1000	---	1000	681	8000	4730	3270	1210	2330
10-7-44	1000	---	1000	681	8000	4715	3285	1160	1590
10-8-44	1000	15	985	681	8000	2030	5970	1495	2660
10-9-44	1000	160	840	681	8000	3510	4490	920	1445
10-10-44	1000	220	780	681	8000	3240	4760	1198	2100
10-11-44	1000	200	800	681	12000	8920	3080	----	----
10-12-44	1000	---	1000	681	4000	890	3110	1200	1180
10-16-44	1000	100	900	681	4000	1690	2310	1275	2390
10-17-44	1000	35	965	681	8000	2315	5685	1175	1570
10-19-44	1000	77	923	681	4000	1620	2380	1442	1380
10-20-44	1000	26	974	681	8000	1896	6104	1202	1287
10-21-44	1000	2	998	681	8000	4303	3697	1467	1630
10-22-44	1000	---	1000	681	8000	3634	4366	1133	2035
10-23-44	1000	5	995	681	8000	3291	4709	1328	1838
10-24-44	1000	---	1000	681	8000	3609	4391	1227	2337
10-25-44	1000	36	964	681	8000	2780	5220	1329	1630
10-26-44	<u>1000</u>	<u>41</u>	<u>959</u>	<u>681</u>	<u>8000</u>	<u>4023</u>	<u>3977</u>	<u>1168</u>	<u>1685</u>
Total	20000	929	19071	13620	151610	68126	83484	23504	33872
Average	1000	46.5	953.6	681.0	7580.5	3406.3	4174.2	1175.2	1693.6

Table 22.

Second Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in GramsLot 2
Ewe 143

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
11-21-44	1000	—	1000	681	4000	2060	1940	1610	2225
11-22-44	1000	36	964	681	7000	2107	4893	1260	1250
11-23-44	1000	47	953	681	7000	2885	4115	1512	2025
11-24-44	1000	58	942	681	7000	4020	2980	1210	1835
11-25-44	1000	53	947	681	7000	4995	2005	1445	2293
11-26-44	1000	47	953	681	4000	1675	2325	1025	1587
11-27-44	1000	86	914	681	7000	1828	5172	1067	1015
11-28-44	1000	72	928	681	7000	3880	3620	1277	1490
11-29-44	1000	81	919	681	7000	4565	2435	1367	2075
11-30-44	1000	77	923	681	4000	1350	2650	1218	1563
12-5-44	1000	86	914	681	8000	6784	1216	1297	2547
12-6-44	1000	56	944	681	7000	2200	4800	1245	1395
12-7-44	1000	61	939	681	7000	3450	3550	1135	1650
12-8-44	1000	63	937	681	7000	3395	3605	981	1230
12-9-44	1000	72	928	681	7000	3615	3385	1455	1560
12-10-44	1000	69	931	681	4000	1840	2160	1097	1192
12-11-44	1000	81	919	681	7000	2740	4260	1336	1640
12-12-44	1000	77	923	681	7000	4065	2935	1435	1362
12-13-44	1000	86	914	681	7000	2355	4645	1350	1495
12-14-44	<u>1000</u>	<u>70</u>	<u>930</u>	<u>681</u>	<u>7000</u>	<u>4280</u>	<u>2720</u>	<u>1550</u>	<u>1580</u>
Total	20000	1278	18722	13620	129000	63589	65411	25872	33009
Average	1000	63.9	936.1	681.0	6450.0	3179.4	3270.6	1293.6	1650.5

Table 23.

Third Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in GramsLot 2
Ewe 143

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
3-13-45	1000	320	680	681	7000	3975	3025	1160	1340
3-14-45	1000	410	590	681	7000	4020	2980	1075	1080
3-15-45	1000	430	570	681	7000	3990	3010	620	1240
3-16-45	1000	444	556	681	7000	5350	1650	542	1110
3-17-45	1000	451	549	681	7000	3850	3150	712	740
3-18-45	1000	438	562	681	7000	5440	1560	657	410
3-19-45	1000	446	554	681	7000	4040	2960	595	585
3-20-45	1000	387	613	681	7000	4165	2835	715	1125
3-21-45	1000	412	588	681	7000	4890	2110	535	675
3-22-45	1000	428	572	681	7000	3600	3400	529	860
3-27-45	1000	246	754	681	7000	4920	2080	700	1585
3-28-45	1000	262	738	681	7000	3320	3680	485	820
3-29-45	1000	213	787	681	7000	3745	3255	611	1170
3-30-45	1000	221	779	681	7000	4195	2805	622	855
3-31-45	1000	214	786	681	7000	2560	4440	884	635
4-1-45	1000	252	748	681	7000	3185	3815	918	1815
4-2-45	1000	264	736	681	7000	3570	3430	957	1800
4-3-45	1000	255	745	681	7000	3000	4000	1103	1340
4-4-45	1000	247	753	681	7000	3405	3595	1225	1345
4-5-45	<u>1000</u>	<u>249</u>	<u>751</u>	<u>681</u>	<u>7000</u>	<u>2921</u>	<u>4079</u>	<u>1150</u>	<u>1212</u>
Total	20000	6589	13411	13620	140000	78141	61859	15786	21742
Average	1000	329.5	670.6	681.0	7000	3907.1	3093.0	789.3	1087.1

Table 24.

First Digestion - Balance Trail

Daily Feed, Water, And Excreted Data
in GramsLot 3
Ewe 80

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
10-3-44	1000	40	960	681	8580	5745	2835	1409	1602
10-4-44	1000	35	965	681	7500	3830	3670	1184	1484
10-5-44	1000	35	965	681	8000	5355	2645	1014	1512
10-6-44	1000	35	965	681	8000	5480	2520	1009	1602
10-7-44	1000	25	975	681	8000	4445	3555	1024	1487
10-8-44	1000	70	930	681	8000	3070	4930	1374	2687
10-9-44	1000	100	900	681	8000	4635	3365	1199	1527
10-10-44	1000	150	850	681	8000	2525	5475	1128	1587
10-11-44	1000	90	910	681	8000	6330	1670	----	----
10-12-44	1000	---	1000	681	4000	920	3080	1164	1537
10-16-44	1000	90	910	681	8000	5720	2280	1474	2837
10-17-44	1000	30	970	681	8000	4260	3740	1294	1722
10-19-44	1000	89	911	681	4000	1570	2430	1504	1506
10-20-44	1000	27	973	681	8000	3295	4705	1394	1416
10-21-44	1000	14	986	681	8000	4112	3888	1473	1682
10-22-44	1000	81	919	681	8000	4504	3496	1208	2646
10-23-44	1000	20	980	681	8000	4521	3479	870	1857
10-24-44	1000	21	979	681	8000	3501	4499	1104	1557
10-25-44	1000	9	991	681	8000	4612	3388	1291	1904
10-26-44	<u>1000</u>	<u>21</u>	<u>979</u>	<u>681</u>	<u>8000</u>	<u>4173</u>	<u>3827</u>	<u>1264</u>	<u>1649</u>
Total	20000	982	19018	13620	152080	82603	69477	23381	33801
Average	1000	49.1	950.9	681.0	7604.0	4130.2	3473.9	1169.1	1690.1

Table 25.

Second Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in GramsLot 3
Ewe 80

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
11-21-44	1000	—	1000	681	4000	2185	1815	1704	1787
11-22-44	1000	17	983	681	7000	2822	4178	1119	1517
11-23-44	1000	62	938	681	7000	3605	3395	1618	1960
11-24-44	1000	46	954	681	7000	2842	4158	1374	2034
11-25-44	1000	71	929	681	7000	5175	1825	1494	1721
11-26-44	1000	64	936	681	8000	1835	6165	1079	1672
11-27-44	1000	37	963	681	7000	2277	4723	1263	1247
11-28-44	1000	81	919	681	7000	4195	2805	1246	1832
11-29-44	1000	48	952	681	7000	4480	2520	1286	1827
11-30-44	1000	94	906	681	4000	1525	2475	1296	1844
12-5-44	1000	22	978	681	8000	5846	2154	1364	1692
12-6-44	1000	27	973	681	7000	3740	3260	1304	1392
12-7-44	1000	36	964	681	7000	5040	1960	1228	1722
12-8-44	1000	31	969	681	7000	3250	3750	942	1617
12-9-44	1000	48	952	681	7000	4610	2390	1214	1242
12-10-44	1000	52	948	681	4000	2342	1658	1110	1417
12-11-44	1000	36	964	681	7000	3050	3950	1298	1487
12-12-44	1000	46	954	681	7000	4915	2085	1408	1429
12-13-44	1000	27	973	681	7000	3635	3365	1204	1502
12-14-44	<u>1000</u>	<u>86</u>	<u>914</u>	<u>681</u>	<u>7000</u>	<u>3600</u>	<u>3400</u>	<u>1399</u>	<u>2247</u>
Total	20000	931	19069	13620	133000	70969	62031	25950	33188
Average	1000	465.5	953.5	681.0	6500.0	3548.4	3101.6	1297.5	1659.4

Table 26.

Third Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in Grams

Lot 3

Ewe 80

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
3-13-45	1000	215	785	681	7000	2980	4020	1105	920
3-14-45	1000	220	780	681	7000	3830	3170	1374	1350
3-15-45	1000	231	769	681	7000	3030	3970	1166	1670
3-16-45	1000	242	758	681	7000	3510	3490	1264	1570
3-17-45	1000	192	808	681	7000	5130	1870	1224	1370
3-18-45	1000	201	799	681	7000	2205	4795	766	1085
3-19-45	1000	246	754	681	7000	3305	3695	1254	2160
3-20-45	1000	238	762	681	7000	3530	3470	1254	2025
3-21-45	1000	245	755	681	7000	3615	3385	1029	1490
3-22-45	1000	240	760	681	7000	3375	3625	889	1770
3-27-45	1000	200	800	681	7000	4960	2040	814	930
3-28-45	1000	186	814	681	7000	3435	3565	764	1505
3-29-45	1000	221	779	681	7000	3010	3990	1224	1685
3-30-45	1000	193	807	681	7000	2640	4360	1027	1500
3-31-45	1000	207	793	681	7000	3960	3040	954	1775
4-1-45	1000	206	794	681	7000	3965	3035	1066	930
4-2-45	1000	185	815	681	7000	3405	3595	974	1920
4-3-45	1000	193	807	681	7000	3880	3120	1080	1520
4-4-45	1000	198	802	681	7000	4910	2090	1174	1395
4-5-45	<u>1000</u>	<u>204</u>	<u>796</u>	<u>681</u>	<u>7000</u>	<u>2876</u>	<u>4124</u>	<u>929</u>	<u>1400</u>
Total	20000	4263	15737	13620	140000	71551	68449	21331	29970
Average	1000	213.2	786.8	681.0	7000	3577.6	3422.5	1066.6	1498.5

Table 27.

First Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in GramsLot 3
Ewe 66

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
10-3-44	1000	5	995	681	8715	4980	3735	1395	2599
10-4-44	1000	5	995	681	7500	2865	4635	1175	1816
10-5-44	1000	---	1000	681	8000	3040	4960	1195	2494
10-6-44	1000	---	1000	681	8000	3660	4340	1220	2369
10-7-44	1000	5	995	681	8000	3470	4530	1425	2364
10-8-44	1000	---	1000	681	8000	1475	6525	1850	3219
10-9-44	1000	70	930	681	8000	1800	6200	1160	2209
10-10-44	1000	140	860	681	8000	2520	5480	1350	3214
10-11-44	1000	40	960	681	13000	7360	5640	-----	-----
10-12-44	1000	---	1000	681	4000	900	3100	1950	2779
10-16-44	1000	20	980	681	8000	4900	3100	1010	2744
10-17-44	1000	15	985	681	8000	1870	6130	1790	1809
10-19-44	1000	73	927	681	4000	900	3100	2295	2492
10-20-44	1000	11	989	681	8000	1805	6195	1961	2623
10-21-44	1000	5	995	681	8000	1805	6195	1805	3374
10-22-44	1000	---	1000	681	8000	2206	5794	1637	2356
10-23-44	1000	7	993	681	8000	2653	5347	1600	2330
10-24-44	1000	10	990	681	8000	3086	4914	1449	3389
10-25-44	1000	26	974	681	8000	2448	5552	1385	2091
10-26-44	<u>1000</u>	<u>37</u>	<u>963</u>	<u>681</u>	<u>8000</u>	<u>2549</u>	<u>5451</u>	<u>1260</u>	<u>2231</u>
Total	20000	469	19531	13620	157215	56292	100923	28912	48502
Average	1000	23.5	976.6	681.0	7860.8	2814.6	5046.2	1445.6	2425.1

Table 28.

Second Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in Grams

Lot 3

Ewe 66

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
11-21-44	1000	—	1000	681	4000	940	3060	2210	1904
11-22-44	1000	6	994	681	7000	1799	5201	1345	1638
11-23-44	1000	17	983	681	7000	1910	5090	1705	2784
11-24-44	1000	21	979	681	7000	1970	5030	1610	2154
11-25-44	1000	19	981	681	7000	2770	4230	2012	2766
11-26-44	1000	32	968	681	8000	1420	6580	1166	2389
11-27-44	1000	21	979	681	7000	1805	5195	1515	1629
11-28-44	1000	4	996	681	7000	1805	5195	1389	1567
11-29-44	1000	7	993	681	7000	3415	3585	1825	2039
11-30-44	1000	12	988	681	4000	953	3047	1465	2211
12-5-44	1000	18	982	681	8000	4467	3533	1952	2119
12-6-44	1000	13	987	681	7000	2715	4285	1870	2459
12-7-44	1000	11	989	681	7000	2580	4420	1513	2429
12-8-44	1000	—	1000	681	7000	1813	5187	1227	1609
12-9-44	1000	—	1000	681	7000	2430	4570	1755	2044
12-10-44	1000	3	997	681	4000	1640	2360	1451	2032
12-11-44	1000	6	994	681	7000	1965	5035	1470	1759
12-12-44	1000	—	1000	681	7000	1970	5030	1932	1281
12-13-44	1000	11	989	681	7000	1817	5183	2180	2212
12-14-44	<u>1000</u>	<u>8</u>	<u>992</u>	<u>681</u>	<u>7000</u>	<u>2810</u>	<u>4190</u>	<u>2030</u>	<u>2139</u>
Total	20000	209	19791	13620	133000	42994	900060	33622	41164
Average	1000	10.5	989.6	681.0	6650.0	2149.7	4500.3	1681.1	2058.2

Table 29.

Third Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in GramsLot 3
Ewe 66

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
3-13-45	1000	120	880	681	7000	4650	2350	740	797
3-14-45	1000	135	865	681	7000	2790	4210	1470	2167
3-15-45	1000	175	825	681	7000	5780	5220	1507	1717
3-16-45	1000	186	814	681	7000	2520	4480	1180	1717
3-17-45	1000	201	799	681	7000	1910	5090	1110	1857
3-18-45	1000	221	779	681	7000	2395	4605	885	1697
3-19-45	1000	164	836	681	7000	2330	4670	1440	1807
3-20-45	1000	142	858	681	7000	1855	5145	1180	2257
3-21-45	1000	154	846	681	11000	5515	5485	1205	1537
3-22-45	1000	167	833	681	7000	2925	4075	1115	1897
3-27-45	1000	123	877	681	7000	2555	4445	1140	3914
3-28-45	1000	131	869	681	7000	1875	5125	1025	2267
3-29-45	1000	114	886	681	7000	2040	4960	1200	2295
3-30-45	1000	117	883	681	7000	1860	5140	1285	2011
3-31-45	1000	121	879	681	7000	1990	5010	1120	2047
4-1-45	1000	146	854	681	7000	2165	4835	1067	1606
4-2-45	1000	112	888	681	7000	2170	4830	1295	2807
4-3-45	1000	117	883	681	7000	2290	4610	1523	1927
4-4-45	1000	124	876	681	7000	3285	3715	1507	2542
4-5-45	<u>1000</u>	<u>126</u>	<u>874</u>	<u>681</u>	<u>7000</u>	<u>2660</u>	<u>4340</u>	<u>1133</u>	<u>2099</u>
Total	20000	2896	17104	13620	148000	55660	92340	24127	40965
Average	1000	144.8	855.2	681.0	7400.0	2783.0	4617.0	1206.4	2048.3

Table 30.

First Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in GramsLot 4
Ewe 93

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
10-3-44	1000	15	985	681	8950	4450	4500	1152	967
10-4-44	1000	10	990	681	7500	5210	2290	1267	1312
10-5-44	1000	10	990	681	8000	3835	4165	1102	1287
10-6-44	1000	5	995	681	8000	5655	2345	1222	1237
10-7-44	1000	---	1000	681	8000	6615	1385	1122	1172
10-8-44	1000	5	995	681	8000	980	7020	1477	2647
10-9-44	1000	5	995	681	8000	4840	3160	1097	1227
10-10-44	1000	130	870	681	8000	2040	5960	1591	1535
10-11-44	1000	50	950	681	8000	5750	2250	----	----
10-12-44	1000	---	1000	681	4000	940	3060	1747	1547
10-16-44	1000	35	965	681	8000	5760	2240	1602	2482
10-17-44	1000	25	975	681	8000	2460	5540	1707	1089
10-19-44	1000	70	930	681	4000	1550	2450	2017	1475
10-20-44	1000	23	977	681	8000	2605	5395	1795	1406
10-21-44	1000	13	987	681	8000	2948	5052	1557	2432
10-22-44	1000	3	997	681	8000	4321	3679	1039	1306
10-23-44	1000	7	993	681	8000	4237	3763	1268	1742
10-24-44	1000	---	1000	681	8000	5765	2235	1281	1907
10-25-44	1000	39	961	681	8000	4991	3009	1249	1532
10-26-44	<u>1000</u>	<u>46</u>	<u>954</u>	<u>681</u>	<u>8000</u>	<u>2656</u>	<u>5344</u>	<u>1134</u>	<u>1332</u>
Total	20000	491	19509	13620	152450	77608	74842	26426	29634
Average	1000	24.6	975.5	681.0	7622.5	3880.4	3742.1	1321.3	1481.7

Table 31.

Second Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in GramsLot 4
Ewe 93

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
11-21-44	1000	—	1000	681	4000	1840	2160	2250	1697
11-22-44	1000	10	990	681	7000	2550	4450	1204	1569
11-23-44	1000	17	983	681	7000	3260	3740	1684	2131
11-24-44	1000	23	977	681	7000	4015	2985	1187	1827
11-25-44	1000	32	968	681	7000	4615	2385	1507	2082
11-26-44	1000	37	963	681	8000	1615	6385	957	1750
11-27-44	1000	26	974	681	7000	3055	3945	1312	1116
11-28-44	1000	31	969	681	7000	3740	2260	1301	1212
11-29-44	1000	41	959	681	7000	4705	2295	1440	1432
11-30-44	1000	26	974	681	4000	990	3010	1189	2017
12-5-44	1000	12	988	681	8000	5665	2335	1732	1122
12-6-44	1000	16	984	681	7000	2890	3110	1329	1217
12-7-44	1000	21	979	681	7000	4540	2460	1458	1892
12-8-44	1000	7	993	681	7000	3411	3589	1014	1407
12-9-44	1000	4	996	681	7000	4525	2475	1497	1762
12-10-44	1000	16	984	681	4000	1980	2020	1012	1252
12-11-44	1000	27	973	681	7000	2925	4075	1414	1677
12-12-44	1000	11	989	681	7000	4090	2910	1431	1510
12-13-44	1000	14	986	681	7000	2710	4290	1292	1707
12-14-44	<u>1000</u>	<u>18</u>	<u>982</u>	<u>681</u>	<u>7000</u>	<u>3505</u>	<u>3495</u>	<u>1517</u>	<u>1827</u>
Total	20000	389	19411	13620	133000	67056	65944	27727	32206
Average	1000	19.5	970.5	681.0	6650.0	3352.8	3297.2	1386.4	1610.3

Table 32.

Third Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in Grams

Lot 4

Ewe 93

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
3-13-44	1000	325	675	681	7000	5520	1480	972	1116
3-14-45	1000	315	685	681	7000	4010	2990	974	911
3-15-45	1000	341	659	681	7000	2730	4270	947	1301
3-16-45	1000	322	678	681	7000	4290	2710	987	1251
3-17-45	1000	312	688	681	7000	7000	—	967	1191
3-18-45	1000	307	693	681	7000	2795	4205	306	771
3-19-45	1000	316	684	681	7000	5530	1470	712	596
3-20-45	1000	326	674	681	7000	3785	3215	777	931
3-21-45	1000	304	696	681	7000	4375	2625	752	716
3-22-45	1000	280	720	681	7000	4986	2014	662	691
3-27-45	1000	517	483	681	7000	4200	2800	807	841
3-28-45	1000	486	514	681	7000	3200	3800	747	911
3-29-45	1000	497	503	681	7000	4940	2060	907	941
3-30-45	1000	521	479	681	7000	2625	4375	877	1251
3-31-45	1000	526	474	681	7000	4240	2760	799	691
4-1-45	1000	516	484	681	7000	5555	1445	826	641
4-2-45	1000	487	513	681	7000	5480	1520	517	506
4-3-45	1000	498	502	681	7000	5685	1315	499	526
4-4-45	1000	566	434	681	7000	4455	2545	661	331
4-5-45	<u>1000</u>	<u>552</u>	<u>448</u>	<u>681</u>	<u>7000</u>	<u>5846</u>	<u>1154</u>	<u>505</u>	<u>782</u>
Total	20000	8314	11686	13620	140000	91247	48753	15201	16896
Average	1000	415.7	584.3	681.0	7000	4562.4	2437.7	7600.5	8448.0

Table 33.

First Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in GramsLot 4
Ewe 131

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
10-3-44	1000	115	885	681	7800	5515	2285	906	886
10-4-44	1000	130	870	681	7500	4790	2710	806	861
10-5-44	1000	130	870	681	8000	4855	3145	871	976
10-6-44	1000	140	860	681	8000	5230	2770	1176	1146
10-7-44	1000	120	880	681	8000	5055	2945	1056	1151
10-8-44	1000	130	870	681	8000	1050	6950	1296	1596
10-9-44	1000	105	895	681	8000	4945	3055	976	1366
10-10-44	1000	170	830	681	8000	3505	4495	1050	1031
10-11-44	1000	220	780	681	8000	8000	-----	-----	-----
10-12-44	1000	---	1000	681	4000	950	3050	1151	1016
10-16-44	1000	120	880	681	8000	6050	1950	946	996
10-17-44	1000	85	915	681	8000	4950	3050	1196	894
10-19-44	1000	174	826	681	4000	1325	2675	1346	1086
10-20-44	1000	80	920	681	8000	1913	6087	1016	1118
10-21-44	1000	82	918	681	8000	5140	2861	1433	1251
10-22-44	1000	110	890	681	8000	4969	3011	716	1023
10-23-44	1000	120	880	681	8000	5185	2815	854	1096
10-24-44	1000	98	902	681	8000	7078	922	898	1018
10-25-44	1000	71	929	681	8000	3814	4186	948	1059
10-26-44	<u>1000</u>	<u>83</u>	<u>917</u>	<u>681</u>	<u>8000</u>	<u>5845</u>	<u>2155</u>	<u>938</u>	<u>960</u>
Total	20000	2283	17717	13620	151300	90164	61136	19579	20530
Average	1000	114.2	885.9	681.0	7565.0	4508.2	3056.8	978.9	1026.5

Table 34.

Second Digestion - Balance Trial

Daily Feed, Water, and Excreted Data
in Grams

Lot 4

Ewe 131

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
11-21-44	1000	126	874	681	4000	4000	—	980	1376
11-22-44	1000	201	799	681	7000	3189	3811	1021	1081
11-23-44	1000	224	776	681	7000	5320	1680	1311	1201
11-24-44	1000	186	814	681	7000	5185	1815	1011	906
11-25-44	1000	236	764	681	7000	5080	1920	1130	1146
11-26-44	1000	116	884	681	8000	2010	5990	921	806
11-27-44	1000	193	807	681	7000	4095	2905	1051	741
11-28-44	1000	264	736	681	7000	4190	2810	1026	786
11-29-44	1000	176	824	681	7000	5025	1975	1086	926
11-30-44	1000	211	789	681	4000	4000	—	745	1016
12-5-44	1000	236	764	681	8000	7270	1730	851	886
12-6-44	1000	141	859	681	8000	4920	3080	1104	1096
12-7-44	1000	170	830	681	7000	3975	3025	1202	1646
12-8-44	1000	181	819	681	7000	3145	3855	991	1660
12-9-44	1000	172	828	681	7000	4450	2550	1191	1133
12-10-44	1000	189	811	681	7000	2135	1865	928	986
12-11-44	1000	201	799	681	7000	4295	2705	1118	1226
12-12-44	1000	164	836	681	7000	3135	3865	1224	1046
12-13-44	1000	176	824	681	7000	5420	1580	1340	946
12-14-44	<u>1000</u>	<u>186</u>	<u>814</u>	<u>681</u>	<u>7000</u>	<u>2930</u>	<u>4070</u>	<u>1161</u>	<u>986</u>
Total	20000	3749	16251	13620	134000	83769	50231	21392	21596
Average	1000	187.5	812.6	681.0	6700.0	4188.5	2511.6	1069.6	1079.8

Table 35.

Third Digestion - Balance Trial

Daily Feed, Water, and Excretion Data
in GramsLot 4
Ewe 131

Date	Hay	Refused	Consumed	Grain	Water	Refused	Consumed	Feces	Urine
3-13-45	1000	225	775	681	7000	4730	2270	870	826
3-14-45	1000	230	770	681	7000	3495	3505	698	936
3-15-45	1000	209	791	681	7000	3450	3550	731	951
3-16-45	1000	186	814	681	7000	3700	3300	776	956
3-17-45	1000	194	806	681	7000	2990	4010	883	986
3-18-45	1000	201	799	681	7000	4095	2905	636	1031
3-19-45	1000	186	814	681	7000	4480	2520	956	1276
3-20-45	1000	212	788	681	7000	3970	3030	821	936
3-21-45	1000	194	806	681	7000	3910	3090	806	906
3-22-45	1000	214	786	681	7000	4010	2990	860	962
3-27-45	1000	418	582	681	7000	6620	380	1006	1180
3-28-45	1000	396	604	681	7000	3770	3230	676	836
3-29-45	1000	422	578	681	7000	4240	2760	956	968
3-30-45	1000	437	563	681	7000	3155	3845	636	721
3-31-45	1000	412	588	681	7000	4120	2880	580	591
4-1-45	1000	396	604	681	7000	4610	2390	794	1196
4-2-45	1000	437	563	681	7000	5320	1680	698	836
4-3-45	1000	418	582	681	7000	3430	3570	778	886
4-4-45	1000	427	573	681	7000	5220	1780	722	716
4-5-45	<u>1000</u>	<u>404</u>	<u>596</u>	<u>681</u>	<u>7000</u>	<u>2420</u>	<u>4580</u>	<u>708</u>	<u>978</u>
Total	20000	6218	13782	13620	140000	81735	58265	15591	18674
Average	1000	310.9	689.1	681.0	7000	4086.8	2913.3	779.6	933.7

Table 36.

Consumption, Excretion and Digestibility
of Dry Matter

Lot No.	Ewe No.	1st. Balance Trial				D. M. Digested gms.	Apparent Digestibility of Dry Matter %
		Dry Matter in			Feces gms.		
		Hay	Grain	Total			
		Fed	Fed	Fed			
		gms.	gms.	gms.			
1	144	868.77	629.58	1498.35	415.03	1083.32	72.30
	76	846.59	629.58	1476.17	356.07	1120.10	75.88
2	114	861.92	629.58	1491.50	392.10	1099.40	73.71
	143	874.66	629.58	1504.24	363.49	1140.75	75.84
3	80	872.42	629.58	1502.00	413.02	1088.98	72.50
	66	894.47	629.58	1524.05	408.38	1115.67	73.20
4	93	893.56	629.58	1523.14	453.73	1069.41	70.21
	131	816.42	629.58	1446.00	339.01	1106.99	76.56

Table 37.

Consumption, Excretion and Digestibility
of Dry Matter

2nd Balance Trial

Lot No	Ewe No.	Dry Matter in			Feces	D. M. Digested	Apparent Digestibility of Dry Matter %
		Hay Fed	Grain Fed	Total Fed			
		gms.	gms.	gms.	gms.	gms.	
1	144	869.08	616.17	1485.25	499.11	986.14	66.40
	76	844.13	616.17	1460.30	480.20	980.10	67.12
2	114	771.15	616.17	1387.32	485.20	902.12	65.03
	143	838.70	616.17	1454.87	496.22	985.65	65.89
3	80	852.74	616.17	1468.91	453.35	1015.56	69.14
	66	881.95	616.17	1498.12	474.91	1023.21	68.30
4	93	874.66	616.17	1490.83	520.85	969.98	65.06
	131	758.75	616.17	1374.92	430.09	974.83	68.72

Table 38.

Consumption, Excretion and Digestibility
of Dry Matter

3rd Balance Trial

Lot No.	Ewe No.	Dry Matter in			Feces	D. M. Digested	Apparent Digestibility of Dry Matter %
		Hay Fed	Grain Fed	Total Fed			
		gms.	gms.	gms.	gms.	gms.	
1	144	712.24	580.42	1292.66	435.92	856.74	66.28
	76	611.18	580.42	1191.60	370.26	821.34	68.93
2	114	668.52	580.42	1248.94	386.22	862.72	69.08
	143	491.68	580.42	1072.10	312.48	759.62	70.85
3	80	590.04	580.42	1170.46	417.98	752.48	64.29
	66	647.84	580.42	1228.26	391.82	836.44	68.10
4	93	418.74	580.42	999.16	337.92	661.24	66.18
	131	507.37	580.42	1087.79	323.59	764.20	70.25

Table 39.

Consumption, Excretion and Digestibility
of Ash

1st Balance Trial

Lot No.	Ewe No.	Ash in			Feces	Ash Digested	Apparent Digestibility of Ash %
		Hay Fed	Grain Fed	Total Fed			
		gms.	gms.	gms.	gms.	gms.	
1	144	78.99	36.96	115.95	55.28	60.67	52.32
	76	77.51	36.96	114.47	53.30	61.17	53.44
2	114	78.53	36.96	115.49	57.44	58.05	50.26
	143	79.38	36.96	116.34	54.23	62.11	53.39
3	80	79.23	36.96	116.19	60.59	55.60	47.85
	66	80.70	36.96	117.66	60.52	57.14	48.56
4	93	80.64	36.96	117.60	61.39	56.21	47.80
	131	75.50	36.96	112.46	55.33	57.13	50.80

Table 40.

Consumption, Excretion and Digestibility
of Ash

2nd Balance Trial

Lot No.	Ewe No.	Ash in			Feces	Ash Digested	Apparent Digestibility of Ash %
		Hay Fed	Grain Fed	Total Fed			
		gms.	gms.	gms.	gms.	gms.	
1	144	81.45	29.21	110.66	58.20	52.46	47.41
	76	79.65	29.21	108.86	59.21	49.65	45.61
2	114	74.38	29.21	103.59	57.93	45.66	44.07
	143	79.26	29.21	108.47	62.18	46.29	42.67
3	80	80.27	29.21	109.48	54.04	55.44	50.64
	66	82.38	29.21	111.59	57.99	53.60	48.03
4	93	81.85	29.21	111.06	62.29	48.77	43.91
	131	72.04	29.21	101.26	56.17	45.09	44.53

Table 41.

Consumption, Excretion and Digestibility
of Ash

3rd Balance Trial

Lot No.	Ewe No.	Ash in			Feces	Ash Digested	Apparent Digestibility of Ash %
		Hay Fed	Grain Fed	Total Fed			
		gms	gms.	gms.	gms.	gms.	
1	144	66.59	24.96	91.55	48.65	42.90	46.86
	76	55.67	24.96	80.63	38.10	42.53	52.75
2	114	61.87	24.96	86.83	38.31	48.52	55.88
	143	42.75	24.96	67.71	33.44	34.27	50.61
3	80	53.38	24.96	78.34	41.09	37.25	47.55
	66	59.63	24.96	84.59	41.53	43.06	50.90
4	93	34.87	24.96	59.83	35.85	23.98	40.08
	131	44.45	24.96	69.41	42.33	27.08	39.01

Table 42.

Consumption, Excretion, Retention and
Digestibility of Nitrogen

1st Balance Trial

Lot No.	Ewe No.	Nitrogen fed			Nitrogen excreted			Nitrogen Digested gms.	Apparent Digestibility %	Nitrogen Retention gms.
		In Hay gms.	In Grain gms.	Total gms.	In Feces gms.	In Urine gms.	Total gms.			
1	144	20.761	19.78	40.541	11.322	24.64	35.962	29.219	72.07	4.579
	76	20.501	19.78	40.281	9.913	26.95	36.863	30.368	75.39	3.418
2	114	20.696	19.78	40.476	10.238	25.11	35.348	30.238	74.71	5.128
	143	20.858	19.78	40.638	7.993	26.75	34.743	32.645	80.33	5.895
3	80	20.829	19.78	40.609	9.570	28.08	37.650	31.039	76.43	2.959
	66	21.110	19.78	40.890	10.785	28.74	39.525	30.105	73.62	1.365
4	93	21.098	19.78	40.878	11.479	30.63	42.109	29.399	71.92	- 1.231
	131	20.117	19.78	39.897	7.828	18.91	26.738	32.069	80.38	13.159

Table 43.

Consumption, Excretion, Retention and
Digestibility of Nitrogen

2nd Balance Trial

Lot No.	Ewe No.	Nitrogen fed			Nitrogen excreted			Nitrogen Digested gms.	Apparent Digestibility %	Nitrogen Retention gms.
		In Hay gms.	In Grain gms.	Total gms.	In Feces gms.	In Urine gms.	Total gms.			
1	144	21.849	17.01	38.859	10.501	23.99	34.491	28.358	72.98	4.368
	76	21.493	17.01	38.503	9.570	22.24	31.810	28.933	75.14	6.693
2	114	20.452	17.01	37.462	9.326	23.75	33.076	28.136	75.11	4.386
	143	21.415	17.01	38.425	10.351	27.61	37.961	28.074	73.06	.464
3	80	21.616	17.01	38.626	9.511	28.66	38.171	29.115	75.38	.455
	66	22.032	17.01	39.042	10.405	26.31	36.715	28.637	73.35	2.327
4	93	21.929	17.01	38.939	10.500	29.30	39.800	28.439	73.03	- .861
	131	21.937	17.01	38.947	8.378	17.52	25.898	30.569	78.49	13.049

Table 44.

Consumption, Excretion, Retention and
Digestibility of Nitrogen

3rd Balance Trial

Lot No.	Ewe No.	Nitrogen fed			Nitrogen excreted			Nitrogen Digested gms.	Apparent Digestibility %	Nitrogen Retention gms.
		In Hay gms.	In Grain gms.	Total gms.	In Feces gms.	In Urine gms.	Total gms.			
1	144	11.611	12.20	23.811	12.738	27.33	40.068	11.073	46.50	-16.257
	76	9.821	12.20	22.021	9.382	25.30	34.682	12.639	57.40	-12.661
2	114	10.836	12.20	23.036	9.679	24.87	34.549	13.357	57.98	-11.513
	143	7.705	12.20	19.905	8.124	20.29	28.414	11.781	59.19	- 8.509
3	80	9.447	12.20	21.647	11.060	25.00	36.060	10.587	48.91	-14.413
	66	10.470	12.20	22.670	10.309	26.41	36.719	12.361	54.53	-14.049
4	93	6.413	12.20	18.613	7.843	22.58	30.423	10.770	57.86	-11.810
	131	7.983	12.20	20.183	9.002	24.50	33.502	11.181	55.40	-13.319

Table 45.

Consumption, Excretion, Digestibility and Retention
of Calcium

1st Balance Trial

Lot No.	Ewe No.	Calcium fed			Calcium Excreted			Calcium Digested gms.	Apparent Digesti- bility %	Calcium Retention gms.
		In Hay	In Grain	Total	In Feces	In Urine	Total			
		gms.	gms.	gms.	gms.	gms.	gms.			
1	144	6.926	.359	7.285	9.068	.064	9.132	-1.783	-24.47	-1.847
	76	6.813	.359	7.172	8.304	.062	8.366	-1.132	-15.78	-1.194
2	114	6.891	.359	7.250	9.340	—	—	-2.090	-28.83	—
	143	6.957	.359	7.316	7.833	.074	7.907	-0.517	-7.07	-0.591
3	80	6.945	.359	7.304	9.817	.059	9.876	-2.513	-34.41	-2.572
	66	7.058	.359	7.417	9.466	.073	9.539	-2.049	-27.63	-2.122
4	93	7.054	.359	7.413	10.232	.086	10.318	-2.819	-38.03	-2.905
	131	6.658	.359	7.017	9.262	—	—	-2.245	-31.99	—

Table 46.

Consumption, Excretion, Digestibility and Retention
of Calcium

2nd Balance Trial

Lot No.	Ewe No.	Calcium fed			Calcium excreted			Calcium Digested gms.	Apparent Digesti- bility %	Calcium Retention gms.
		In Hay gms.	In Grain gms.	Total gms.	In Feces gms.	In Urine gms.	Total gms.			
1	144	7.653	.382	8.035	9.438	.031	9.464	-1.398	-17.40	-1.429
	76	7.491	.382	7.873	11.328	.024	11.352	-3.455	-43.88	-3.479
2	114	7.017	.382	7.399	10.640	.023	10.663	-3.241	-43.80	-3.264
	143	7.455	.382	7.837	11.433	.033	11.466	-3.596	-45.88	-3.629
3	80	7.547	.382	7.929	9.742	.077	9.819	-1.813	-22.87	-1.890
	66	7.736	.382	8.118	10.144	.076	10.220	-2.026	-24.96	-2.102
4	93	7.689	.382	8.071	11.203	.060	11.263	-3.132	-38.81	-3.192
	131	6.807	.382	7.189	9.866	.036	9.902	-2.677	-37.24	-2.713

Table 47.

Consumption, Excretion, Digestibility and Retention
of Calcium

3rd Balance Trial

Lot No.	Ewe No.	Calcium fed			Calcium excreted			Calcium Digested	Apparent Digesti- bility %	Calcium Retention gms.
		In Hay	In Grain	Total	In Feces	In Urine	Total			
		gms.	gms.	gms.	gms.	gms.	gms.	gms.		
1	144	6.709	.302	7.011	5.737	.027	5.764	1.274	18.17	1.247
	76	5.783	.302	6.085	5.184	.012	5.196	0.901	14.81	0.889
2	114	6.309	.302	6.611	5.345	.027	5.372	1.266	19.15	1.239
	143	4.689	.302	4.991	3.781	.018	3.799	1.210	24.24	1.192
3	80	5.590	.302	5.892	5.296	.016	5.312	.596	10.12	0.580
	66	6.119	.302	6.421	5.603	.020	5.623	0.818	12.65	0.798
4	93	4.021	.302	4.323	5.130	.020	5.150	-0.807	-18.67	-0.827
	131	4.833	.302	5.135	5.520	.020	5.540	-0.385	- 7.50	-0.405

Table 48.

Consumption, Excretion, Digestibility and Retention
of Phosphorus

1st Balance Trial

Lot No.	Ewe No.	Phosphorus fed			Phosphorus excreted			Phosphorus Digested gms.	Apparent Digesti- bility %	Phosphorus Retention gms.
		In Hay gms.	In Grain gms.	Total gms.	In Feces gms.	In Urine gms.	Total gms.			
1	144	2.105	3.708	5.813	3.544	.016	3.560	2.269	39.03	2.253
	76	2.079	3.708	5.787	3.336	.013	3.349	2.451	42.35	2.438
2	114	2.097	3.708	5.805	3.745	—	—	2.060	35.49	—
	143	2.112	3.708	5.820	3.457	.015	3.472	2.363	40.60	2.348
3	80	2.110	3.708	5.818	2.767	.015	3.782	2.051	35.25	2.036
	66	2.135	3.708	5.843	3.888	.015	3.903	1.955	33.46	1.940
4	93	2.134	3.708	5.842	3.653	.015	3.668	2.189	37.47	2.174
	131	2.044	3.708	5.752	3.539	—	—	2.213	38.47	—

Table 49.

Consumption, Excretion, Digestibility and Retention
of Phosphorus

2nd Balance Trial

Lot No.	Ewe No.	Phosphorus fed			Phosphorus excreted			Phosphorus Digested gms.	Apparent Digesti- bility %	Phosphorus Retention gms.
		In Hay	In Grain	Total	In Feces	In Urine	Total			
		gms.	gms.	gms.	gms.	gms.	gms.			
1	144	2.394	3.512	5.906	4.088	.015	4.103	1.818	30.78	1.803
	76	2.341	3.512	5.853	4.403	.006	4.409	1.450	24.77	1.444
2	114	2.184	3.512	5.696	4.561	.015	4.576	1.135	19.93	1.120
	143	2.329	3.512	5.841	4.272	.018	4.290	1.569	26.86	1.551
3	80	2.359	3.512	5.871	4.003	.017	4.020	1.868	31.82	1.851
	66	2.422	3.512	5.934	3.704	.019	3.723	2.230	37.58	2.211
4	93	2.406	3.512	5.918	4.636	.017	4.653	1.282	21.66	1.265
	131	2.114	3.512	5.626	3.910	.014	3.924	1.716	30.50	1.702

Table 50.

Consumption, Excretion, Digestibility and Retention
of Phosphorus

3rd Balance Trial

Lot No.	Ewe No.	Phosphorus fed			Phosphorus excreted			Phosphorus Digested gms.	Apparent Digesti- bility %	Phosphorus Retention gms.
		In Hay gms.	In Grain gms.	Total gms.	In Feces gms.	In Urine gms.	Total gms.			
1	144	1.818	3.343	5.161	4.952	.016	4.968	0.209	4.05	.193
	76	1.549	3.343	4.892	3.717	.014	3.731	1.175	24.02	1.161
2	114	1.701	3.343	5.044	3.650	.014	3.644	1.394	27.64	1.400
	143	1.231	3.343	4.574	3.621	.054	3.675	0.953	20.84	.899
3	80	1.493	3.343	4.836	4.117	.030	4.147	0.719	14.87	.689
	66	1.646	3.343	4.989	4.243	.020	4.263	0.746	14.95	.726
4	93	1.037	3.343	4.380	4.423	.015	4.438	-0.043	0.98	-.058
	131	1.273	3.343	4.616	4.071	.015	4.086	0.545	11.81	.530

Table 51.

Wool Shrinkage

1944

Lot No.	Ewe No.	Grease Wool Bone Dry Weight gms.	Dusted Wool Bone Dry gms.	Dirt %	Shrinkage %	Yield %	Clean Wool Bone Dry gms.
1	144	5016.60	3466.91	30.91	59.66	40.34	2024.10
	76	5056.44	4191.84	17.10	63.18	36.82	1861.78
	132	5008.44	3998.81	21.16	52.93	47.07	2354.47
	148	<u>6612.44</u>	<u>5939.19</u>	<u>10.18</u>	<u>58.02</u>	<u>41.98</u>	<u>2775.90</u>
	Average	5423.83	4399.18	19.84	58.45	41.55	2254.06
2	114	5845.23	4895.86	16.24	56.43	43.57	2546.77
	143	6694.27	5318.74	20.55	57.90	42.10	2818.29
	108	5664.82	4702.67	16.98	51.74	48.26	2733.84
	118	<u>5901.41</u>	<u>5061.70</u>	<u>14.23</u>	<u>56.58</u>	<u>43.42</u>	<u>2562.39</u>
	Average	6026.43	4994.74	17.00	55.66	44.34	2665.32
3	80	4131.87	3667.26	11.24	57.80	42.20	1743.65
	66	5806.61	5306.99	8.60	58.82	43.18	2507.29
	52	4642.82	3805.96	18.02	56.02	43.98	2041.91
	64	<u>4876.92</u>	<u>4424.12</u>	<u>9.28</u>	<u>53.36</u>	<u>46.64</u>	<u>2274.60</u>
	Average	4864.56	4301.08	11.79	56.00	44.00	2141.86
4	93	5980.95	4983.30	16.68	53.66	47.34	2831.38
	131	5263.31	4266.44	18.94	61.16	38.84	2044.27
	54	6502.38	5460.15	16.03	57.03	42.97	2794.07
	129	<u>5859.42</u>	<u>4933.06</u>	<u>15.81</u>	<u>57.62</u>	<u>42.38</u>	<u>2483.22</u>
	Average	5901.52	4910.73	16.87	57.12	42.88	2538.24

Table 52.

Wool Shrinkage

1945

Lot No.	Ewe No.	Grease Wool Bone Dry Weight gms.	Dusted Wool Bone Dry gms.	Dirt %	Shrinkage %	Yield %	Clean Wool Bone Dry gms.
1	144	4643.00	4599.00	.95	41.92	58.08	2696.65
	76	4528.00	4431.00	2.14	55.04	44.96	2035.79
	132	3940.00	3801.00	3.53	42.27	57.73	2274.56
	148	<u>6506.00</u>	<u>6450.00</u>	<u>.86</u>	<u>50.43</u>	<u>49.57</u>	<u>3225.02</u>
	Average	4904.25	4820.25	1.87	47.42	52.59	2558.00
2	114	5526.00	5446.00	1.45	45.23	54.77	3026.59
	143	6067.00	5885.00	3.00	48.36	51.64	3133.00
	108	5831.00	5752.00	1.35	42.01	57.99	3381.40
	118	<u>5219.00</u>	<u>5117.00</u>	<u>1.95</u>	<u>44.58</u>	<u>55.42</u>	<u>2892.37</u>
	Average	5660.75	5550.00	1.94	45.05	54.96	3108.34
3	80	4995.00	4732.00	5.27	50.86	49.14	2454.54
	66	7530.00	7403.00	1.69	57.08	42.92	3231.88
	52	5718.00	5389.00	5.75	44.36	55.64	3181.50
	64	<u>5149.00</u>	<u>5069.00</u>	<u>1.55</u>	<u>47.57</u>	<u>52.43</u>	<u>2699.62</u>
	Average	5848.00	5648.25	3.57	49.97	50.03	2891.89
4	93	4900.00	4721.00	3.65	40.83	59.17	2899.33
	131	4912.00	4879.00	1.67	43.92	56.08	2754.65
	54	6178.00	5924.00	4.11	48.19	51.81	3200.82
	129	<u>5449.00</u>	<u>5391.00</u>	<u>1.06</u>	<u>48.68</u>	<u>51.32</u>	<u>2796.43</u>
	Average	5359.75	5228.75	2.62	45.40	54.60	2912.80

Table 53.

Protamone Feeding Experiment
Wool Diameter Measurements*

Lot	Ewe	1944								1945			
		6-1	6-29	7-27	8-24	9-21	10-19	11-17	12-14	1-11	2-8	3-8	4-5
1	144	5.01	6.48	6.45	6.76	6.75	6.72	6.50	6.45	6.13	6.51	6.21	6.60
	76	5.46	7.03	7.21	7.13	7.47	7.42	7.93	7.92	7.06	7.30	6.53	6.61
	132	5.30	6.80	5.87	6.57	6.66	6.84	6.43	6.62	6.41	5.79	5.77	6.04
	<u>148</u>	<u>4.49</u>	<u>5.49</u>	<u>5.83</u>	<u>6.04</u>	<u>6.47</u>	<u>6.46</u>	<u>6.77</u>	<u>6.36</u>	<u>6.60</u>	<u>5.81</u>	<u>5.92</u>	<u>5.92</u>
	Ave.	5.07	6.45	6.34	6.63	6.84	6.86	6.91	6.84	6.55	6.35	6.11	6.29
2	114	5.38	6.49	6.46	6.62	7.16	7.29	6.27	7.39	6.45	6.32	6.55	6.60
	143	5.50	7.22	6.22	6.46	6.77	6.95	6.67	6.54	7.02	5.85	5.66	6.41
	108	5.71	7.25	7.81	7.80	7.50	7.90	9.59	8.96	8.08	8.66	8.18	7.27
	<u>118</u>	<u>5.45</u>	<u>6.80</u>	<u>7.32</u>	<u>7.29</u>	<u>7.74</u>	<u>7.80</u>	<u>7.32</u>	<u>8.26</u>	<u>7.51</u>	<u>8.51</u>	<u>7.32</u>	<u>7.53</u>
	Ave.	5.51	6.94	6.95	7.04	7.29	7.49	7.46	7.79	7.27	7.34	6.93	6.95
3	80	4.42	6.93	6.50	6.49	6.88	6.65	6.90	6.86	6.36	6.67	6.11	6.39
	66	5.62	6.81	6.20	6.80	7.06	6.79	7.30	6.61	6.36	6.59	6.48	6.26
	52	4.95	6.46	5.93	5.84	6.30	6.46	6.78	6.98	6.19	6.77	6.13	6.73
	<u>64</u>	<u>5.06</u>	<u>6.13</u>	<u>6.15</u>	<u>6.47</u>	<u>7.00</u>	<u>7.12</u>	<u>7.00</u>	<u>7.30</u>	<u>6.19</u>	<u>6.50</u>	<u>6.21</u>	<u>6.17</u>
	Ave.	5.01	6.58	6.20	6.40	6.81	6.76	7.00	6.94	6.28	6.63	6.23	6.39
4	93	5.80	6.71	7.50	7.32	7.24	8.66	8.48	7.93	7.22	7.47	6.76	6.91
	131	5.42	6.40	6.34	6.20	6.84	6.64	6.38	7.01	6.55	5.95	5.80	6.03
	54	6.31	6.71	6.98	6.89	7.37	7.22	7.40	7.05	6.70	6.47	7.17	6.49
	<u>129</u>	<u>5.29</u>	<u>7.00</u>	<u>6.97</u>	<u>7.32</u>	<u>7.08</u>	<u>7.42</u>	<u>7.06</u>	<u>7.64</u>	<u>7.57</u>	<u>7.45</u>	<u>6.95</u>	<u>7.01</u>
	Ave.	5.71	6.71	6.95	6.93	7.13	7.49	7.33	7.41	7.01	6.84	6.67	6.61

* Average of 100 fibers measured in 1/10,000 inch

Table 54.

Protamone Feeding Experiment
Wool Length Measurements*

Lot	Ewe	1944								1945			
		6-1	6-29	7-27	8-24	9-21	10-19	11-17	12-14	1-11	2-8	3-8	4-5
1	144	.620	.791	.865	.893	.974	1.012	.886	.938	.969	.981	1.047	1.066
	76	.600	.756	.757	.769	.808	.830	.847	.869	.914	.949	1.057	1.066
	132	.661	.696	.730	.951	.840	.882	.803	.812	.967	.924	.930	.934
	148	<u>.636</u>	<u>.717</u>	<u>.829</u>	<u>.819</u>	<u>.795</u>	<u>.829</u>	<u>.880</u>	<u>.898</u>	<u>.977</u>	<u>1.009</u>	<u>1.047</u>	<u>1.083</u>
	Ave.	.629	.740	.795	.858	.854	.888	.854	.879	.957	.966	1.020	1.037
2	114	.625	.726	.801	.886	.838	.863	.884	.900	.933	.946	1.081	1.112
	143	.742	.842	.831	.991	.897	.960	.965	.985	.925	.943	1.122	1.132
	108	.616	.635	.728	.858	.813	.841	.839	.847	.838	.848	.854	.867
	118	<u>.683</u>	<u>.682</u>	<u>.835</u>	<u>.834</u>	<u>.825</u>	<u>.840</u>	<u>.850</u>	<u>.870</u>	<u>.917</u>	<u>.923</u>	<u>.943</u>	<u>.950</u>
	Ave.	.667	.721	.799	.892	.843	.876	.885	.901	.903	.915	1.000	1.015
3	80	.562	.560	.757	.711	.792	.812	.844	.865	.858	.891	.837	.887
	66	.647	.813	.790	.898	.815	.857	.842	.859	.895	.928	1.039	1.068
	52	.844	.890	.930	1.023	1.010	1.047	1.018	1.064	1.070	1.122	1.057	1.095
	64	<u>.705</u>	<u>.755</u>	<u>.849</u>	<u>.806</u>	<u>.925</u>	<u>.958</u>	<u>.890</u>	<u>.918</u>	<u>.887</u>	<u>.905</u>	<u>1.036</u>	<u>1.052</u>
	Ave.	.690	.755	.832	.860	.886	.919	.899	.927	.928	.962	.992	1.025
4	93	.609	.666	.678	.876	.821	.879	.952	.962	.943	.955	1.002	1.042
	131	.633	.783	.773	.804	.858	.867	.873	.896	.946	.973	.956	.966
	54	.797	.790	.904	.912	1.007	1.033	1.030	1.050	1.038	1.056	1.168	1.260
	129	<u>.637</u>	<u>.754</u>	<u>.897</u>	<u>.901</u>	<u>.931</u>	<u>.996</u>	<u>.893</u>	<u>.909</u>	<u>.983</u>	<u>1.037</u>	<u>1.002</u>	<u>1.018</u>
	Ave.	.669	.748	.813	.873	.904	.944	.937	.954	.978	1.005	1.032	1.072

* Average of 100 fibers measured in millimeters

Table 55.

Grease Content in Periodically Shaven Wool Samples

Lot No.	Ewe No.	Date of Sampling					
		6-1-44	6-29	7-27	8-24	9-21	10-19
Percentage Grease							
1	144	20.63	16.67	14.21	12.98	15.92	16.38
	76	21.12	20.90	11.22	16.86	15.91	24.41
	132	17.47	15.56	12.43	11.27	16.47	12.46
	148	<u>24.44</u>	<u>18.90</u>	<u>17.45</u>	<u>15.06</u>	<u>21.48</u>	<u>21.58</u>
	Average	20.92	18.01	13.83	14.04	17.45	18.71
2	114	19.33	19.90	19.60	17.05	17.73	18.90
	108	20.64	18.87	15.94	14.06	17.91	20.17
	143	22.11	18.75	16.53	14.21	15.50	13.03
	118	<u>25.55</u>	<u>21.37</u>	<u>17.36</u>	<u>14.69</u>	<u>19.12</u>	<u>23.82</u>
	Average	21.91	19.73	17.36	15.00	17.57	18.98
3	80	15.90	22.66	16.73	17.76	20.96	27.08
	66	16.66	23.41	23.78	18.34	19.42	28.63
	52	21.48	22.96	20.13	16.62	22.32	21.40
	64	<u>21.09</u>	<u>17.07</u>	<u>14.91</u>	<u>15.15</u>	<u>15.25</u>	<u>15.43</u>
	Average	18.78	21.53	18.89	16.97	19.49	23.14
4	93	20.27	19.84	17.57	13.90	13.88	19.05
	131	21.75	15.29	14.55	14.66	15.48	21.42
	54	15.93	12.75	15.37	15.86	15.35	16.51
	129	<u>24.28</u>	<u>18.23</u>	<u>14.43</u>	<u>16.40</u>	<u>18.05</u>	<u>20.88</u>
	Average	20.56	16.53	15.48	15.21	15.69	19.48

Table 55 (cont.) Grease Content in Periodically Shaven Wool Samples
(continued)

Lot No.	Ewe No.	Date of Sampling					
		11-16-44	12-13	1-11-45	2-8	3-8	4-5
<u>Percentage Grease</u>							
1	144	16.08	16.72	15.08	17.19	16.93	16.47
	76	21.90	23.65	20.65	25.10	27.54	25.23
	132	11.68	14.22	12.35	16.24	14.87	14.35
	148	<u>25.49</u>	<u>26.89</u>	<u>28.27</u>	<u>23.28</u>	<u>30.40</u>	<u>30.46</u>
	Average	18.79	20.37	19.09	20.45	22.44	21.63
2	114	20.82	20.10	19.98	25.27	24.63	24.39
	108	15.77	19.49	20.52	29.52	23.18	19.63
	143	18.24	16.49	13.11	17.65	22.82	21.03
	118	<u>22.99</u>	<u>25.68</u>	<u>24.81</u>	<u>26.84</u>	<u>28.30</u>	<u>24.84</u>
	Average	19.46	20.44	19.62	24.82	24.73	22.47
3	80	26.81	23.34	23.36	25.37	27.45	23.72
	66	21.38	26.21	27.16	27.51	33.27	32.84
	52	23.41	18.60	20.16	23.86	23.94	23.03
	64	<u>17.77</u>	<u>23.85</u>	<u>22.85</u>	<u>22.43</u>	<u>23.30</u>	<u>21.00</u>
	Average	22.34	23.00	23.38	24.79	26.99	25.15
4	93	14.10	15.81	15.66	16.53	18.96	16.92
	131	20.61	16.32	22.59	21.26	21.62	22.54
	54	18.44	14.82	15.22	16.41	17.43	17.56
	129	<u>22.72</u>	<u>18.79</u>	<u>15.81</u>	<u>20.13</u>	<u>20.51</u>	<u>18.73</u>
	Average	18.97	16.44	17.32	19.58	19.63	18.94

Table 56.

Salt Content in Periodically Shaven Wool Samples
(In Percent)

Lot No.	May 1944	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan. 1945	Feb.	March	April
1	17.64	17.81	18.01	18.14	17.62	16.36	15.22	15.01	15.10	15.16	15.85	15.84
2	17.86	17.91	18.14	19.01	18.64	18.01	17.83	17.12	17.14	17.36	17.61	17.78
3	17.23	17.47	18.31	18.47	18.36	17.89	17.64	17.06	18.12	19.72	19.70	19.81
4	17.61	17.64	17.71	18.06	18.00	17.64	16.99	15.14	15.12	15.27	15.26	15.49

Table 57.

Monthly Variations in Wool Shaving Samples *

Lot No. 1

	May 1944	June	July	August	September	October
Temperature, °F.	54.2	63.3	69.0	70.0	59.4	50.5
Diameter, mm.	.0129	.0164	.0161	.0168	.0174	.0174
Length, mm.	.629	.740	.795	.858	.854	.888
Volume, .000001 mm. ³	8.221	15.632	16.185	19.019	20.307	21.116
Grease, percent	20.92	18.01	13.83	14.04	14.75	18.71
Salt, percent	17.64	17.81	18.01	18.14	17.62	16.36

* Each figure average per lot

Table 57 (cont.)

Monthly Variations in Wool Shaving Samples *

Lot No. 1
(continued)

	November	December	January 1945	February	March	April
Temperature, °F.	37.4	26.6	28.8	30.9	38.4	39.6
Diameter, mm.	.0176	.0174	.0166	.0161	.0155	.0160
Length, mm.	.854	.879	.957	.966	1.020	1.037
Volume, .000001 mm. ³	20.777	20.902	20.712	19.666	19.246	20.850
Grease, percent	18.79	20.37	19.09	20.45	22.44	21.63
Salt, percent	15.22	15.01	15.10	15.16	15.85	15.84

* Each figure average per lot

Table 58.

Monthly Variations in Wool Shaving Samples *

Lot No.. 2

	May 1944	June	July	August	September	October
Temperature, °F.	54.2	63.3	69.0	70.0	59.4	50.5
Diameter, mm	.0140	.0176	.0177	.0179	.0185	.0190
Length, mm.	.667	.721	.799	.892	.843	.876
Volume, .000001 mm. ³	10.268	17.541	19.660	22.447	22.660	24.837
Grease, percent	21.91	19.73	17.36	15.00	17.57	18.98
Salt, percent	17.86	17.91	18.14	19.01	18.64	18.01

* Each figure average per lot

Table 58 (cont.)

Monthly Variations in Wool Shaving Samples *

Lot No. 2
(continued)

	November	December	January 1945	February	March	April
Temperature, °F.	37.4	26.6	28.8	30.9	38.4	39.6
Diameter, mm.	.0189	.0198	.0185	.0186	.0176	.0177
Length, mm.	.885	.901	.903	.915	1.000	1.015
Volume, .000001 mm. ³	24.829	27.743	24.227	24.862	24.187	24.975
Grease, percent	19.46	20.44	19.62	24.82	24.73	22.47
Salt, percent	17.83	17.12	17.14	17.36	17.61	17.78

* Each figure average per lot

Table 59.

Monthly Variations in Wool Shaving Samples *

Lot No. 3

	May 1944	June	July	August	September	October
Temperature, °F.	54.2	63.3	69.0	70.0	59.4	50.5
Diameter, mm.	.0127	.0167	.0157	.0163	.0173	.0172
Length, mm.	.690	.755	.832	.860	.886	.919
Volume, .000001 mm. ³	8.741	16.538	16.107	17.946	20.826	21.353
Grease, percent	18.78	21.53	18.89	16.97	19.49	23.14
Salt, percent	17.26	17.47	18.31	18.47	18.36	17.89

* Each figure average per lot

Table 59 (cont.)

Monthly Variations in Wool Shaving Samples *

Lot No. 3
(continued)

	November	December	January 1945	February	March	April
Temperature, °F.	37.4	26.6	28.8	30.9	38.4	39.6
Diameter, mm.	.0178	.0176	.0160	.0168	.0158	.0162
Length, mm.	.899	.927	.928	.962	.992	1.025
Volume, .000001 mm. ³	22.372	22.553	18.658	21.325	19.450	21.127
Grease, percent	22.34	23.00	23.38	24.79	26.99	25.15
Salt, percent	17.64	17.06	18.12	19.72	19.70	19.81

* Each figure average per lot

Table 60.

Monthly Variations in Wool Shaving Samples *

Lot No. 4

	May 1944	June	July	August	September	October
Temperature, °F.	54.2	63.3	69.0	70.0	59.4	50.5
Diameter, mm.	.0145	.0170	.0177	.0176	.0181	.0190
Length, mm.	.669	.748	.813	.873	.904	.944
Volume, .000001 mm. ³	11.047	16.978	20.005	21.239	23.260	26.766
Grease, percent	20.56	16.53	15.48	15.21	15.69	19.48
Salt, percent	17.61	17.64	17.71	18.06	18.00	17.64

* Each figure average per lot

Table 60 (cont.)

Monthly Variations in Wool Shaving Samples *

Lot No. 4
(continued)

	November	December	January 1945	February	March	April
Temperature, °F.	37.4	26.6	28.8	30.9	38.4	39.6
Diameter, mm.	.0186	.0188	.0178	.0174	.0169	.0168
Length, mm.	.937	.954	.978	1.005	1.032	1.072
Volume, .000001 mm. ³	25.459	26.482	24.338	23.898	23.150	23.763
Grease, percent	18.97	16.44	17.32	19.58	19.63	18.94
Salt, percent	16.99	15.14	15.12	15.27	15.26	15.49

* Each figure average per lot

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